LIGHTNING AND THE LAWS OF POWER FOLLOW ARC

known Performance

for destinations known or unknow

Today, our electrical equipment encircles the globe; some serving at Greenland's ice cap or in Kiska's fogs . . . others stewing in the swamps of a Pacific atoll.

With the destinations of war-products totally unknown, manufacturers logically have preferred "building-in" WESTONS on their control panels. They know that a WESTON will perform dependably *anywhere* . . . that there is sound reason behind WESTONS acceptance as the *international standard*.

And tomorrow, with equipment reaching known markets, instrument preferences will remain unchanged. For while human life no longer will be at stake, *reputations will*. So manufacturers will continue to "build-in" the instruments which consistently tell-the-truth . . . to build broader market acceptance and customer good-will, and assure highest efficiency from the machines which bear their name.

- Laboratory Standards
- Precision DC and AC Portables
- Instrument Transformers
- Sensitive Relays
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618 FRELINGHUYSEN AVENUE, NEWARK 5, NEW JERSEY

FOR OVER 55 YEARS LEADERS IN ELECTRICAL MEASURING EQUIPMENT

Electrical World

FOUNDED IN 1874 • READ BY ELECTRICAL MEN FOR 70 YEARS

December 9, 1944 — Vol. 122, No. 24

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From .....

To .....

.....

Signed .....

.....

the Birth of the World's Greatest Navy

PEARL HARBOR is a symbol of American bounce. Pearl Harbor December 7, 1941 came as a shock to the nation. Our Pacific fleet, gathered in one harbor, lay helpless under the wings of Japanese treachery.

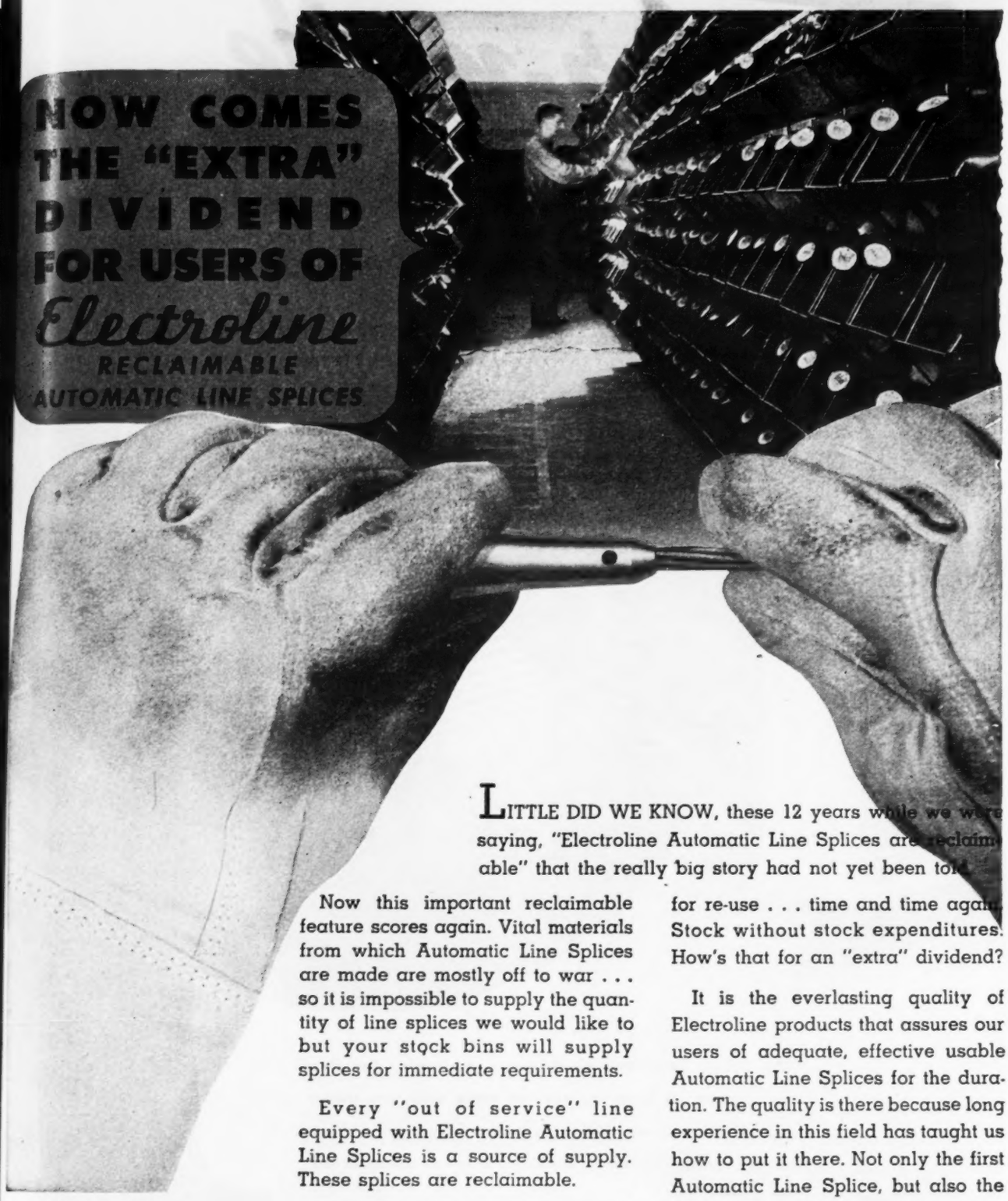
But from that catastrophe has arisen the mightiest fleet of all history. Sunken, fire-blackened hulks were raised and their weaknesses converted to strength. Pearl Harbor ships, reconditioned in record speed, are mightier than ever. And from the ways of Navy Yards and shipyards all over the United States has come a fleet greater than all other navies of the world combined.

For over half a century Okonite has been a Navy supplier of electrical wires and cables. Okonite research men, cooperating with Navy engineers, pioneered such recent improvements as the synthetic impervious sheath that eliminates heavy coverings of lead, glass fibre insulation that resists heat, flameproof synthetic insulations that replaced rubber, "unilay" assembly of conductors that prevented breakage of copper in flexible cables and Okoloy corrosion-resistant coatings for conductors.

We are justifiably proud of our many contributions that have improved the distribution of electrical power in the ships of our Navy. These same improvements have been incorporated in other cable designs used for power and lighting applications in many other industries. The Okonite Company, Passaic, New Jersey.

OKONITE insulated wires and cables

3833



NOW COMES THE "EXTRA" DIVIDEND FOR USERS OF *Electroline* RECLAIMABLE AUTOMATIC LINE SPLICES

LITTLE DID WE KNOW, these 12 years while we were saying, "Electroline Automatic Line Splices are reclaimable" that the really big story had not yet been told.

Now this important reclaimable feature scores again. Vital materials from which Automatic Line Splices are made are mostly off to war . . . so it is impossible to supply the quantity of line splices we would like to but your stock bins will supply splices for immediate requirements.

Every "out of service" line equipped with Electroline Automatic Line Splices is a source of supply. These splices are reclaimable.

Electroline Splices can be removed in a jiffy. Back they go to stock bins for re-use . . . time and time again. Stock without stock expenditures. How's that for an "extra" dividend?

It is the everlasting quality of Electroline products that assures our users of adequate, effective usable Automatic Line Splices for the duration. The quality is there because long experience in this field has taught us how to put it there. Not only the first Automatic Line Splice, but also the first Reclaimable Line Splice came from the house of Electroline.

Electroline Company

Originators and Patentees of Automatic Line Splices and Dead Ends

4121 SOUTH LA SALLE STREET • CHICAGO 9, ILLINOIS

the Birth of the World's Greatest Navy

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Tailor-made

An Elliott 5400-kw. synchronous generator for ship propulsion. A large number of these units are under construction in our Ridgway plant. They typify Elliott engineering excellence, and care in construction detail

ARMY (E) NAVY

ARMY (E) NAVY

ELLIOTT Company

Electric Power Dept., **RIDGWAY, PA.**

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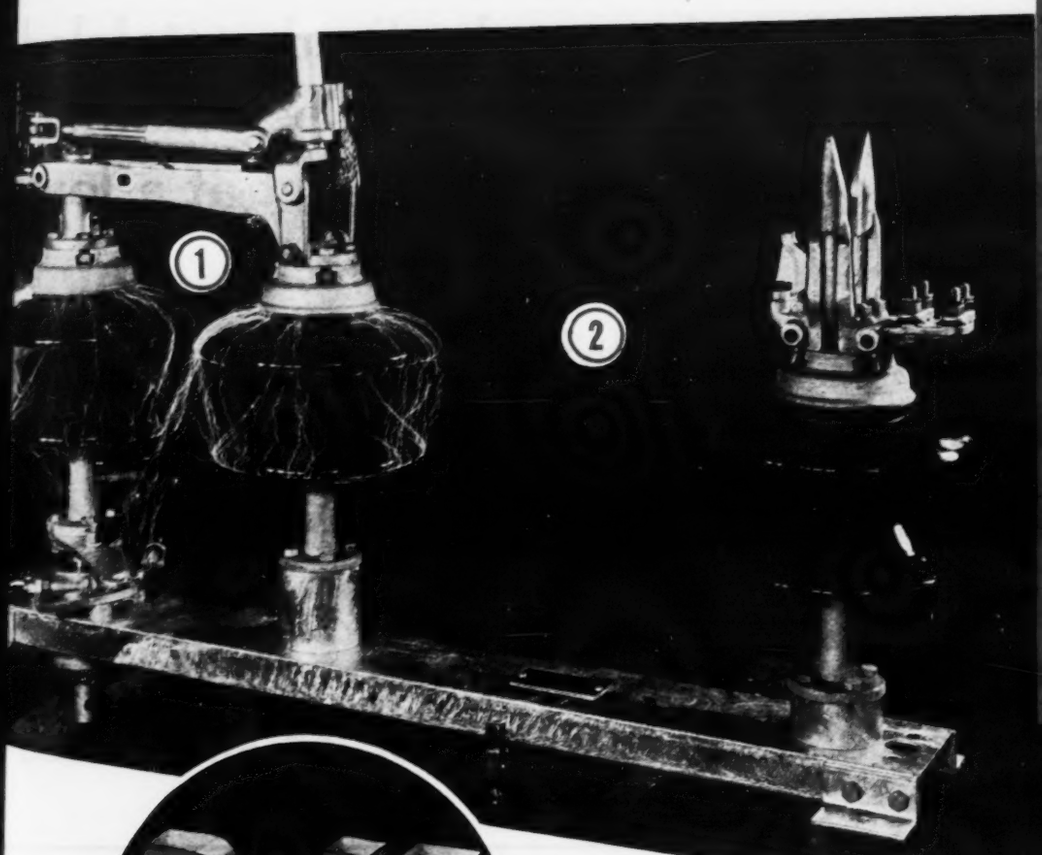
CHECK the FACTS

1. Two-minute flashover on 23 KV Hi-Pressure Contact Switch.
2. Flashover proves open gap dimensions in Switch design.
3. You know in advance that R&IE Equipment will meet your increasingly rigid operating requirements.

The Check List

- CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS
- DISCONNECTING SWITCHES INDOOR AND OUTDOOR
- HORN GAP SWITCHES
- INTERRUPTER SWITCHES
- CUTOUTS AND THERMO-RUPTERS
- SWITCH OPERATING MECHANISMS
- SUBSTATIONS
- OPEN OR ENCLOSED, ISOLATED PHASE HEAVY DUTY BUSES
- KIRK INTERLOCK SYSTEMS
- AUTOMATIC SECTIONALIZING EQUIPMENT
- METAL CUBICLES
- TESTING



Hi-Pressure Contact Switch designs have been tested — for current, short circuit and flashover—in the R&IE laboratories.

R&IE

FLASHOVER TESTING

RAILWAY AND INDUSTRIAL ENGINEERING CO., GREENSBURG, PA.

IN CANADA—EASTERN POWER DEVICES, LIMITED, TORONTO

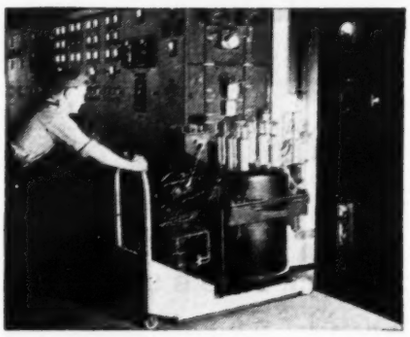
STANDARDIZATION
—by Evolution?—

☛ Today everyone agrees that standardization of electrical apparatus—when practicable—benefits all concerned.

☛ It is clear that the standardized metalclad unit—introduced to America by Allis-Chalmers—has made possible a better product at a lower price.

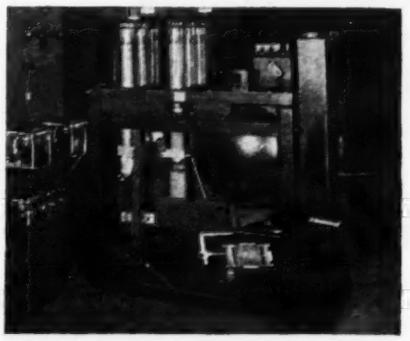
☛ Already, circuit breakers have been standardized dimensionally to fit in standard metalclad switchgear units.

☛ Now the idea has been advanced that the number of types of circuit interrupters available should be reduced in favor of simplified



1

THE OIL CIRCUIT BREAKER, as offered by Allis-Chalmers, is the product of development and research over 40 years. It has high impulse strength, simple mechanical construction, and is "Ruptor"-equipped for lower maintenance operation.



2

AIR BLAST BREAKER, first commercially introduced in this country by Allis-Chalmers six years ago, gives unexcelled all-around performance. Arcing time is within one-half cycle. It is ideally suited for repetitive high current interruption.

OF SWITCHGEAR . .
? — or Revolution?

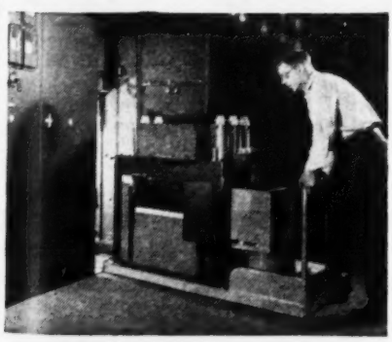
manufacture. Should it be? If so, by whom?

☛ Allis-Chalmers believes generally in the EVOLUTION of electrical apparatus — in which the buyer, with his intimate knowledge of his local problems, is the "agent of natural selection." By this process, the fittest types of equipment are almost certain to survive . . . far more so than if selection depended solely on the judgement of manufacturers.

☛ Thus Allis-Chalmers offers—without price penalty — not one, but *three* types of circuit breakers . . . so that logical evolution of switchgear may take place through buyer choice.

♪ *Tune in the Boston Symphony, Blue Network, every Sat. Eve.*

A 1806



3

THE MAGNETIC AIR BREAKER is popular among operators for moderate capacity installations, in 5 kv voltage and below. Fire hazard is reduced and handling of oil is eliminated in Allis-Chalmers' reliable "Ruptair" magnetic air breaker.

ALLIS-CHALMERS

MILWAUKEE 1, WIS.

HOW *Excellence*

NIMBLE FINGERS *Experienced Sangamo operators develop such a pronounced sense of touch that their handling of MICA in its initial state of preparation—that of splitting—is accomplished with the greatest dexterity and finesse. "Nimble fingers" inaugurate a quality control through ability that is maintained through each process of CAPACITOR production. Thus, faithful performance of the smallest to the largest unit has its beginning in the intricate art of MICA SPLITTING.*

SANGAMO ELECTRIC

ESTABLISHED 1898 • • • MICA CAPACITORS • • •

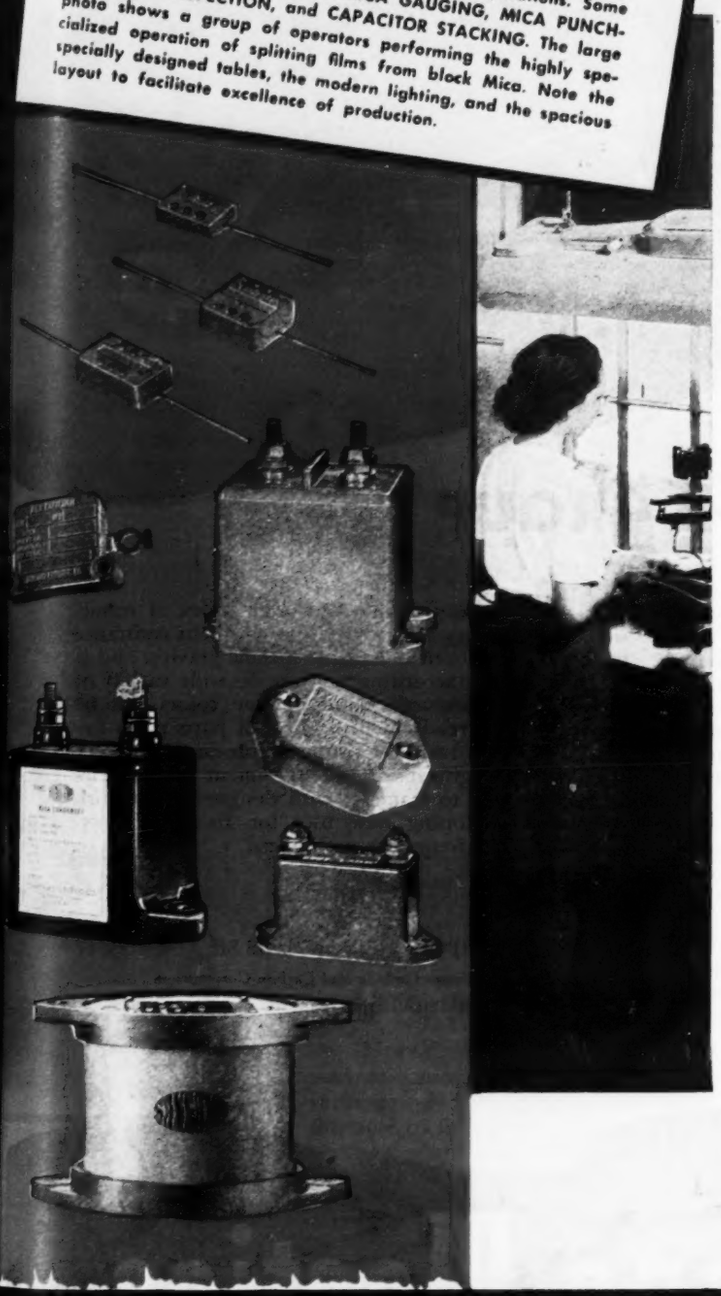
BUILT INTO ...

SANGAMO
MICA CAPACITORS

★

Mica Splitting

The many processes that are required in producing Sangamo MICA CAPACITORS involve numerous critical operations. Some of these are MICA SPLITTING, MICA GAUGING, MICA PUNCHING, MICA INSPECTION, and CAPACITOR STACKING. The large photo shows a group of operators performing the highly specialized operation of splitting films from block Mica. Note the specially designed tables, the modern lighting, and the spacious layout to facilitate excellence of production.



Only the finest obtainable electrical MICA is used for the dielectric of Sangamo MICA CAPACITORS. The largest quantities of high grade block Mica (so called because it is still intact as a block and not split into individual laminations) come from India, although some Brazilian, Argentine, and domestic Micas are equally satisfactory.

For the manufacture of Capacitors, block Mica must be split into uniform, thin laminations. The voltage breakdown depends upon the thickness and quality of the Mica laminations, while the uniformity of the finished capacitors depends, in large measure, upon the uniformity of the thickness of laminations.

Even in these days of mass production and automatic processing machinery, Mica Splitting is still necessarily a hand operation, for no machines have been developed to split Mica satisfactorily. Deft fingers can usually split Mica into laminations to within 0.0005 inch of the required thickness.

There are many methods of splitting Mica. Some operators prefer to split Mica using a flat knife—others use a needle. In some cases the Mica is laid on a glass, plastic, or wooden plate and laminations are split from a flat surface—other operators hold the Mica in the air while splitting. But no matter which method is used, it is imperative that injuries, such as scratching of the surface, or fracturing of the edges, be avoided during the splitting operation.

ARMY E NAVY

COMPANY SPRINGFIELD ILLINOIS

• • • WATT HOUR METERS • • • TIME SWITCHES • • •

BAKELITE

TRADE-MARK

A NEW *All-star* GROUP

BAKELITE polystyrene plastics are now available in several distinct forms. Each member of this new constellation is a star of the first magnitude—with brilliant low-loss electrical insulating performance in high frequency and electronic service. Best known are BAKELITE polystyrene *molding materials*. Of growing importance are *insulating films* and *insulation coatings* made from the base polystyrene resin. Several fabricators have greatly extended the usefulness of this plastic by offering such polystyrene fabricated forms as rigid *sheets, tubes,* and *rods* in various dimensions depending upon source. One fabricator also supplies a flexible film that can be punched and stamped, as well as *filaments* in continuous rolls.

This BAKELITE polystyrene group presents sweeping opportunities for superior and economical high-frequency equipment. In each of its varied forms, BAKELITE polystyrene offers the sterling qualities of resistance to many chemicals, a high index of refraction, transparency and clarity, and excellent resistance to water absorption. It has low specific gravity, and is rigid or flexible, according to form. Its wide variety of transparent, translucent, and opaque colors can be used to enable ready identification of parts or to improve the appearance of countless products.

Our field engineers and development laboratories are always glad to team up with designers and fabricators in developing new uses for BAKELITE polystyrene in high-frequency equipment.

TRADE MARK

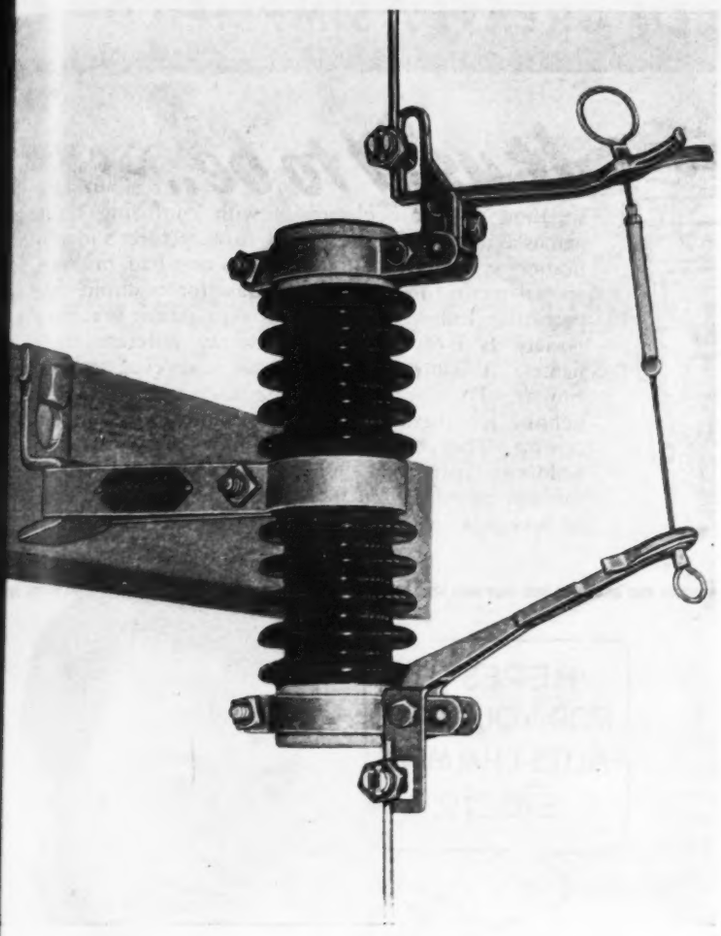
BAKELITE CORPORATION, 30 E. 42 St., New York 17

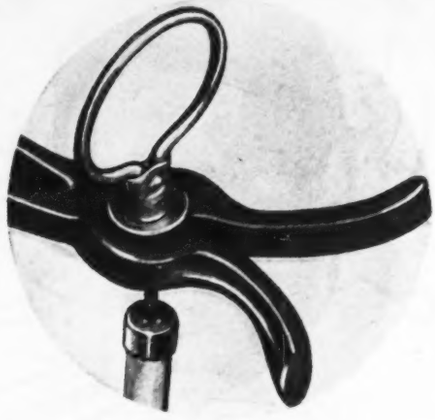
Unit of Union Carbide and Carbon Corporation

UCC

Polystyrene Plastics

STURDY–LOW COST MATTHEWS PROTECTOLINK CUTOUTS





Catalog 1640-50 Amp. 7.5/12.5 KV. Grd. Y — Catalog 1641-50 Amp. 15 KV.

Write for Bulletin 101-A

The design and ruggedness of Matthews Protectolink Cutouts and Protectolinks insures better performance and lower maintenance costs.

Because of the rigid construction of the contact arms they cannot be easily bent out of alignment when fusing or installing the cutout and the fact that the lower arm is actuated by an individual spring, assures positive contact tension on the Matthews Protectolink.

Note design of the contact ends of the arms. They provide easy installation and automatic seating of Protectolink buttons into the cup shaped contact recesses. No wedging of fuse link into contacts is required, thereby preventing damage to fine wires of fuse link cable. Matthews Protectolink Cutouts will also accommodate any make of open link fuse, and Matthews Protectolink Fuse Links fit other makes of open link cutouts.

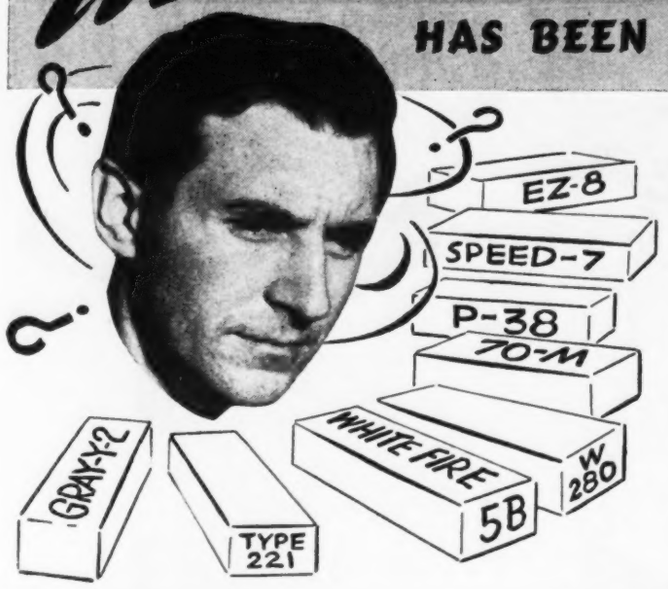
W. N. MATTHEWS CORPORATION

SAINT LOUIS, U. S. A.

ENGINEERS and MANUFACTURERS SINCE 1899

The Art of Buying

ARC WELDING ELECTRODES HAS BEEN GREATLY SIMPLIFIED...



It used to be.. a puzzling situation — those electrodes with confusing trade names and trade numbers. Each manufacturer's identification system was different, each one had his own special name for electrodes. Thus, for example, one particular rod designated by American Welding Society as E-6012 had over twenty different trade names. And no two trade names were even vaguely similar. To a welder selecting a certain rod for a definite job these varying trade names were disconcerting. They had *no* connection with any standard welding classification. Unless he had previously used the rod or took time to check into its classification, he was at a loss to select the correct electrode.

..But now Allis-Chalmers has cut through this mass of confusion and greatly simplified the business of buying electrodes. Official *AWS classification numbers* have been adopted for Allis-Chalmers electrode identification. Thus *AWS E-6012* becomes *Allis-Chalmers E-6012* in the A-C electrode line. It's logical and practical. Correct selection is automatically assured.

Shop-tested and production-proven in A-C's own huge plants, these electrodes are available now at Allis-Chalmers welding dealers and district offices. Write for bulletin B6340. A 1780

ALLIS-CHALMERS

MILWAUKEE 1, WISCONSIN

HEADQUARTERS FOR WELDING EQUIPMENT

AMPAC A-C WELDERS

WELD-O-TRON D-C WELDERS

ALLIS-CHALMERS ELECTRODES

ARC WELDING ACCESSORIES

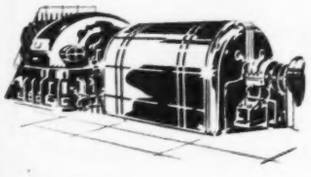
♪ *Tune in the Boston Symphony Blue Network, every Saturday at 8:30 pm, EWT*

~~NEW GARGOYLE~~ D.T.E. OIL SETS NEW RECORDS!

...for Turbine Oil Performance under Severe Operating Conditions

TODAY'S increased steam pressures and temperatures called for this great new turbine oil. So—here it is—the answer to the most severe turbine operating conditions.

Gargoyle D. T. E. Oil 797 has a base stock that is, in itself, an excellent, long-lasting turbine oil. To this superior base stock, we've added extra resistance to oxidation and maximum anti-rust qualities.



The result is the ideal turbine oil, an oil that has already proved its superiority over all other turbine oils in severe tests, an oil that is already setting new standards of performance in all-size turbines.

Ask your Socony-Vacuum representative for full details... for interesting performance figures. He'll be glad to give you all the details.

SOCONY-VACUUM OIL CO., INC., Standard Oil of N.Y. Div. • White Star Div. • Lubrite Div. • Chicago Div. • White Eagle Div. • Wadhams Div. • Magnolia Petroleum Co. • General Petroleum Corp. of Calif.

GARGOYLE

Lubricants

WHAT MAKES A GREAT TURBINE OIL?

✓ ***Excellent Base Stock:*** The fundamental requirement for an ideal turbine oil is a base stock that in itself is an excellent turbine oil with excellent resistance to oxidation.

✓ ***Extra Resistance to Oxidation:*** Oxidation protection —PLUS—is needed to meet the effect of greatly increased temperatures in modern turbine operation. Your turbine oil should have this PLUS protection.

✓ ***Maximum Anti-Rust Qualities:*** The possibility of the presence of water demands that the oil should furnish maximum protection against corrosion. Your turbine oil should give this protection.

THE NEW GARGOYLE D. T. E. OIL 797 HAS ALL OF THESE NECESSARY CHARACTERISTICS

FROM THE LEADER IN LUBRICATION: Socony-Vacuum Oil Co., Inc.

It's **new**! It's **heavy duty**! It's **raintight**!

Type WMKS **Interlocking** Safety Switch and Plug Receptacle

CONDULET

(CONDULETS are made only by CROUSE-HINDS)

for the control of portable electrical equipment in **both** indoor and outdoor locations.

Safety. Positive interlock prevents opening the case or withdrawing the plug unless the switch is "off". Switch can't be turned "on" unless the case is closed and the plug fully inserted.

Switches. Motor circuit switch. Quick make and break. Double break, reinforced, positive pressure-type blade and jaw construction. Positive pressure fuse clips. Combination solder or solderless wire lugs. 2 or 3-pole fusible.

Plug Receptacles. Style I is grounded through the shell. It will take the plugs used with the former Type MKS of the same rating. Style II is grounded through an extra pole and the shell. An eyebolt and wingnut prevents accidental withdrawal of the plug when the switch is open.

Cast metal case. Strong and durable. Four sturdy mounting feet. Many possible threaded hub arrangements for both vertical and horizontal conduit. Cover may be padlocked to prevent unauthorized entry. Operating handle may be padlocked "on" or "off".

Threaded operating shaft. Bearings permanently lubricated to resist corrosion and prevent the entrance of dust and moisture.

Horse-power ratings. 2 through 50 H. P.

30, 60, 100 or 200-ampere. 230 or 575 Volts A. C.

Listed in Condulet Catalog No. 2500, Section 50, Pages 21 and 22

Type WMKS Interlocking Safety Switch and Receptacle Condulet with Type DP Interlocking Plug

A Nationwide Distribution Through Electrical Wholesalers

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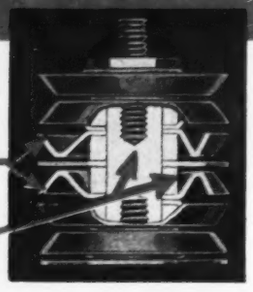
SYRACUSE 1, N. Y., U.S.A.

Offices: Birmingham—Boston—Chicago—Cincinnati—Cleveland—Dallas—Denver—Detroit—Houston—Indianapolis—Kansas City Los Angeles—Milwaukee—Minneapolis New York—Philadelphia—Pittsburgh—San Francisco—Seattle—St. Louis—Washington. *Resident Product Engineers:* Albany—Atlanta—Charlotte—New Orleans
CROUSE-HINDS COMPANY OF CANADA, LTD., *Main Office and Plant:* TORONTO, ONT.

CONDULETS • TRAFFIC SIGNALS • AIRPORT LIGHTING • FLOODLIGHTS

Crystal Valve Design ASSURES High Speed Operation



Sectional view of high-speed gap electrodes.

Spark gap unit completely assembled on steatite rod with steatite spacers.

SPEED of operation of a lightning arrester is a measure of the protection it will give to equipment; speed of operation is controlled largely through spark gap design and construction. Spark gap assemblies are vitally important elements of lightning arresters.

For 30 years lightning arresters of our manufacture have embodied spark gap units of the same basic design illustrated herewith; these incorporate two fundamentally correct major features:

1 • A multi-gap structure.

2 • Sparkover or discharge surfaces that are smooth and flat.

Electrodes are coin-pressed to high accuracy before assembly; accurately ground steatite elements are used to space same; electrodes and spacers are assembled on a steatite rod; a costly structure—yes, but one possessing exceptionally good electrical and mechanical characteristics, highly accurate and uniform operation, short time lag and therefore high speed of operation, heavy surge current discharge capacity—*all of which cooperate with other important features of the Crystal Valve in giving highly efficient protection and long service life.*

More detailed information on the construction, operation, protective characteristics, etc. of Crystal Valve lightning arresters will be found in our current catalog. Write for a copy.

ELECTRIC SERVICE MANUFACTURING COMPANY • 17th & CAMBRIA STS., PHILA. 32, PA.

CRYSTAL VALVE

LIGHTNING ARRESTERS

HONOR GRADUATES OF THE SCHOOL O

hard knocks!

AMERCLAD

will give you long, dependable service under tough working conditions

IN this kind of service — where portable power cables are subjected to every kind of abuse— dragged over rough and rocky ground, hauled through water, grease and mud, stepped on, run over and heartlessly exposed to every change of weather, AMERCLAD really shows how much stamina and endurance can be built into a cable.

Designed and constructed to deliver an uninterrupted flow of power, AMERCLAD Portable Power Cables meet every requirement of the wartime speed up.

AMERCLAD Low Voltage Cables are flexible to permit continual reeling and unreeling, yet are sufficiently tough and rugged to withstand severe usage of all kinds. They are designed to operate satisfactorily under heavy overloads and attendant high temperatures. Their resistance to water, oil and acids is a further aid to long service.

AMERCLAD High Voltage Cables provide high impulse strength plus flexibility without danger of corona cutting so that when operated with suitable line protection they insure continuity of service and freedom from breakdown.

Even now, when crude rubber is not available and the use of Neoprene is greatly restricted, we have developed synthetic rubber compounds for use in Amerclad Cables that carry on the old tradition of trouble-free service. To save time and money, use AMERCLAD.

Building Wire — Rubber or Synthetic resin insulation.
Non-Metallic Sheathed Cable
Service Entrance and Drop Cable
Power Cables — Rubber, Varnished Cambric or Paper Insulation
Armored Submarine or Parkway Cables
Non-Metallic Parkway Cables
Rubber-sheathed Cords and Cables
Heat-proof Asbestos Insulated Cables
Weatherproof and Annunciator Wire
Magnet Wire of all types and sizes
Galvanized Steel Wire and Strand
Rural Distribution Conductors.

AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Export Company, New York

USS

UNITED STATES STEEL

Available in December

h Exclusive Features developed by KEARNEY ENGINEERS

KEARNEY'S

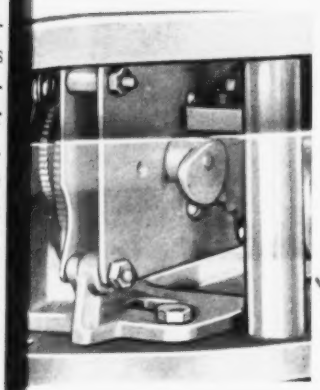
TIME DELAY MECHANISM. The escapement type time delay is a special feature. Its functioning is entirely independent of temperature or oil viscosity. Its operation is as regular and certain as a high grade clock mechanism. A flexible choice of operations is available making possible a coordination with fuse links that is not readily obtainable with the usual OCB's. Choice of 4 fast, 4 slow or any combination of fast and slow operations up to 4 are factory set to meet the requirements of your system.

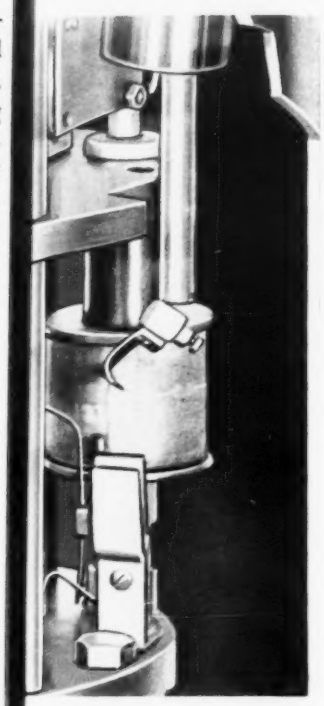
TRIP-COIL RELAY. A new principle is employed for the first time in pole mounted OCB's for controlling the opening mechanism. A Trip-coil of 5, 10, 15, 25 or 50 amperes rating as selected, is the means of eliminating pumping and accurately controlling the opening of the breaker. The Trip-coil carries the line current until a fault current causes its operation. At this time the full fault current is impressed on the actuating coil causing it to act instantaneously and to positively open the circuit. Thus chattering, or pumping, is eliminated. Lower line losses result because the low impedance Trip-coil carries the line current instead of the usual method of carrying line currents through high impedance actuating coils. Further protection against lightning is provided by placing a gap across the terminals of the Trip-coil so that steep wave front lightning surges will be harmlessly discharged without damage to the Trip-coil. Hence, double protection against lightning damage is built into the Kearney OCB.

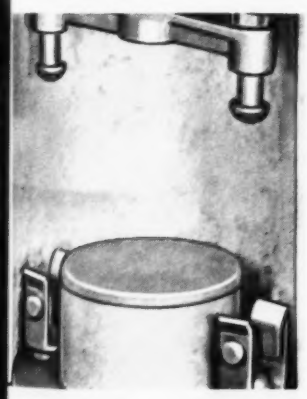
LOAD BREAK DEVICE. Point pressure, double-break contacts of special alloy arc-inhibiting material are used to interrupt fault currents. The interrupting chamber is fibre enclosed (of itself an arc deionizer) and submerged in transil oil. Two vent holes in the fibre are arranged so that the arc-breaking operation of the contacts produces a pumping action to force fresh oil between the contacts. In this way oil-carbonization is held to a minimum, the arcs are more quickly extinguished, and the life of the contacts prolonged.

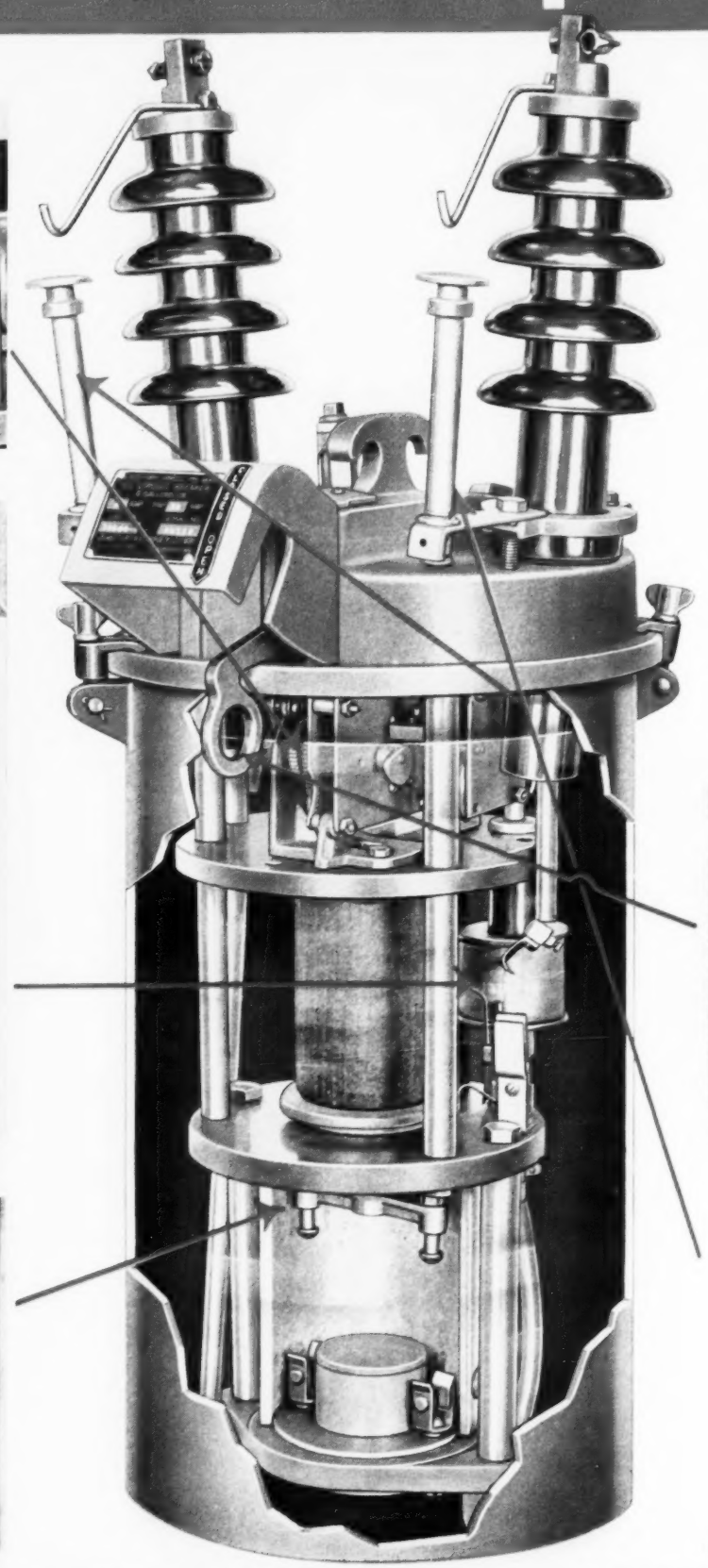
Eliminates

Φ·C·B with 5 Outstanding Operating Features







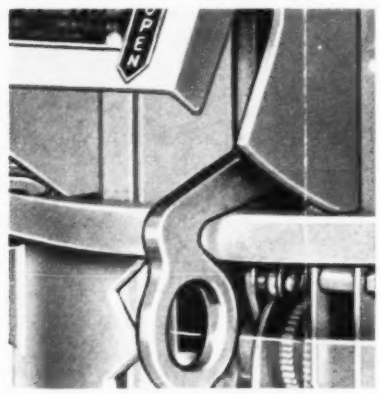


The Kearney OCB is a single pole, steel case, two bushing breaker, arranged for four operations before lockout. Any or all of the operations may be had with or without time delay. For instance two fast openings will usually afford sufficient protection for line equipment and the remaining two slow openings can be adapted to coordination between branch line fuses and the breaker.

VOLTAGE AND AMPERAGE RATING. For use in series on single phase lines of 15,000 volts line to ground or lower . . . Trip-coils which govern the current carrying capacity are available in 5, 10, 15, 25 and 50 ampere ratings. The Trip-coil selected must correspond in rating to maximum continuous load current of the line. Example: For a line carrying a maximum of 10 amperes continuously a breaker having no smaller than a 10 ampere Trip-coil should be ordered.

The Trip-coil relays to open its contacts at double its rated load causing the breaker to operate. Example: A 10 ampere Trip-coil relays at 20 amperes. Therefore, the minimum fault current at point of installation of the breaker must not be less than 20 amperes.

The Trip-coil has a maximum interrupting capacity of from 24 to 30 times its current rating. Therefore, the value of the fault current at the point of installation of the breaker must not be in excess of this value. Example: A 10 ampere Trip-coil has a maximum interrupting capacity of 250 amperes. This size of coil should be used only where the maximum fault line current is less than 250 amperes.

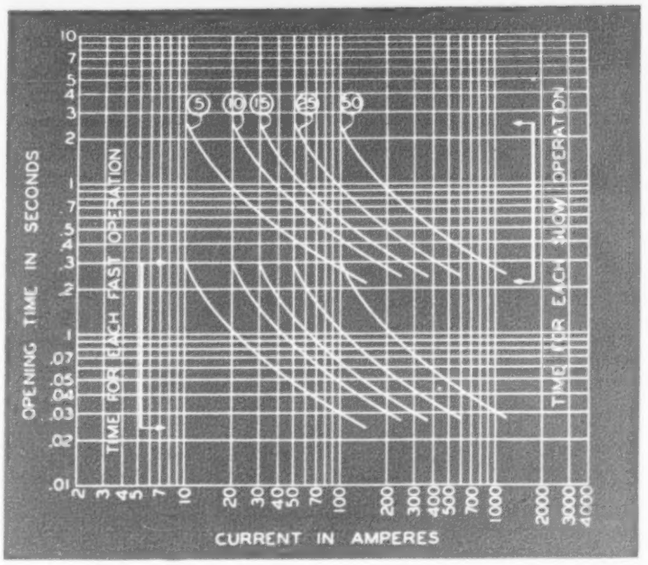


MANUAL TRIP PULL RING. A convenient Pull ring, insulated from all live parts is located within the hood on the cover of the OCB. Operation of the Pull ring is independent of the internal mechanism and moves only when the breaker locks out. The Pull ring mechanism is arranged so that the breaker cannot be held closed on a fault. For manual opening the Pull ring is pulled down with a switch stick whereupon the main contacts are spring actuated into the open position for safer and greater speed of operation. A counter located under the hood records the number of operations.

LIGHTNING ARRESTORS. Kearney OCB'S are fully protected from lightning by *two standard* Type PT arrestors mounted directly on the cover. These are the Kearney expulsion gap arrestors that have established notable records on rural lines throughout the country. As explained elsewhere separate protection is provided for the Trip-coil by means of an internal gap. Your OCB's represent a sizable part of the line investment and upon their proper operation the continuity of service depends. That is why the Kearney OCB comes to you completely equipped with full lightning protection.

Innecessary Fuse Outages · Reduce Service Calls

ELECTRICAL and PHYSICAL DATA on the KEARNEY OIL CIRCUIT BREAKER



FAST AND SLOW CHARACTERISTICS OF THE O.C.B.

ELECTRICAL DATA

1. Minimum Trip-coil operating current is double the rating of the Trip-coil.
2. Open circuit time interval between each reclosure is 2.5 seconds.
3. Time required to automatically reset after one or more operations where lock-out does not occur is about 5 seconds.
4. For various Trip-coils the maximum interrupting capacity is:

5 ampere coil	150 amperes
10 ampere coil	250 amperes
15 ampere coil	375 amperes
25 ampere coil	600 amperes
50 ampere coil	1200 amperes

PHYSICAL DATA

Terminal Wire Size: No. 2 Stranded Copper.

Mounting: Supplied with either lugs for direct pole mounting or standard cross-arm hanger.

Shipping weight (with oil): 190 pounds.

Oil: Capacity 8 gallons. Flash point, 132° C. Fire point, 148° C. Viscosity (Soybolt SSU) 57 seconds at 40° C. Pour test, 40° C. Dielectric strength, 22 KV standard gap.

Oil level gauge . . . is supplied as standard equipment.

How to Order the O·C·B

Please read the information under Voltage and Amperage Rating on the center pages of this circular.

A. Then select the proper Trip-coil rating for your system from the table below.

B. Specify the number of fast and slow reclosures desired.

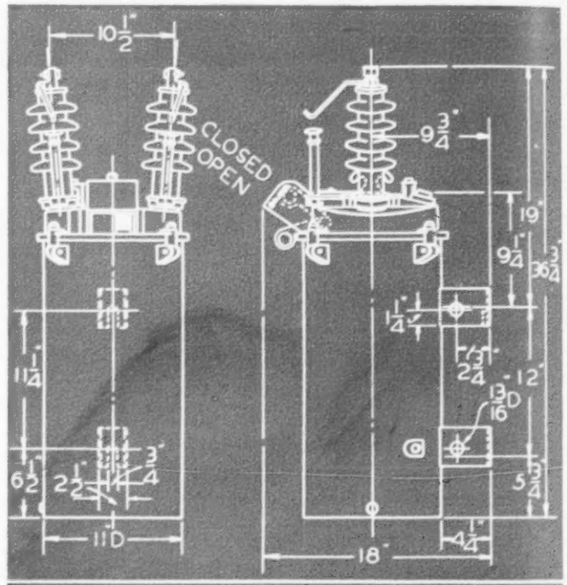
C. Choose between pole and cross-arm mounting. Then write your order like the following example:

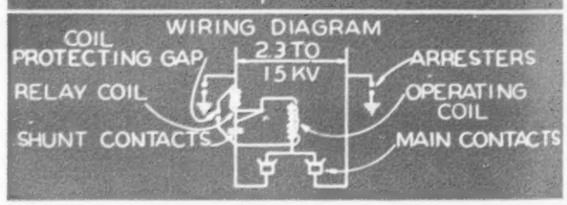
> 25 No. 12800-15 Kearney OCB's—15 amperes, set for 2 fast and 2 slow operations. Cross arm mounting

Trip-coils and fast or slow settings cannot be changed in the field. We suggest removal of the unit to storeroom where such changes can be made conveniently. Write for these instructions.

CATALOG AND DIMENSIONAL DATA

Catalog No.	Trip-coil Amperage	Voltage Rating	Net Price
12800-5	5	15 KV or lower	$85.00 each complete with oil F.O.B. any domestic freight station
12800-10	10		
12800-15	15		
12800-25	25		
12800-50	50		





JAMES R. KEARNEY CORPORATION

Manufacturers and Designers of Overhead and Underground Utility Equipment

4224-42 CLAYTON AVENUE **SAINT LOUIS (10), MISSOURI**

PRINTED IN U. S. A.
5-5-10-44

You Save it

IF IT'S A SERVIT

(Reg./Trade-mark)

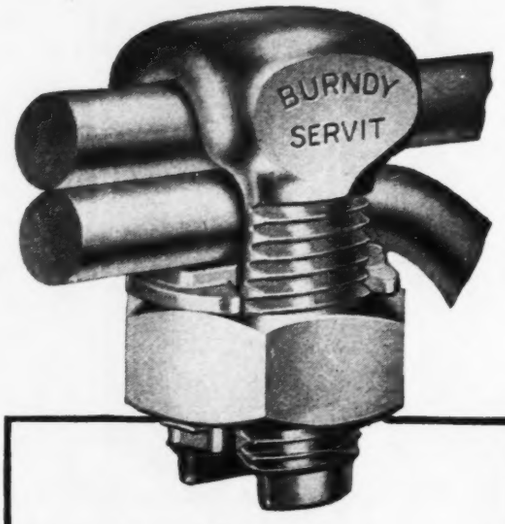
This FORGED Burndy service connector can be used over and over again!

"We use the SERVIT because it has far higher salvage value," recently stated a prominent utility EE in discussing service connectors.

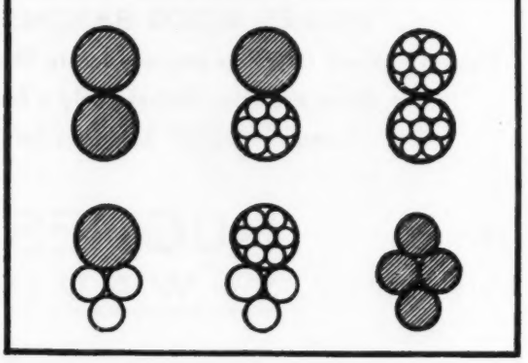
This advantage of *high reuseability* can only be obtained from a connector which possesses unusually high strength *... and the SERVIT has that in abundance.* Skillfully forged, from special high-strength alloys, it permits high compression between conductors, yet, withstands wrench torque, without distortion, *time and again!*

To be sure of obtaining the high salvage value, *lower costs,* which this forged Burndy connector provides, be sure to specify SERVIT for all service connections. Literature on these, and other Burndy connectors, gladly sent on request. Burndy Engineering Co., 107 Bruckner Boulevard, New York 54, N. Y.

IN CANADA: Canadian Line Materials, Limited, Toronto 13



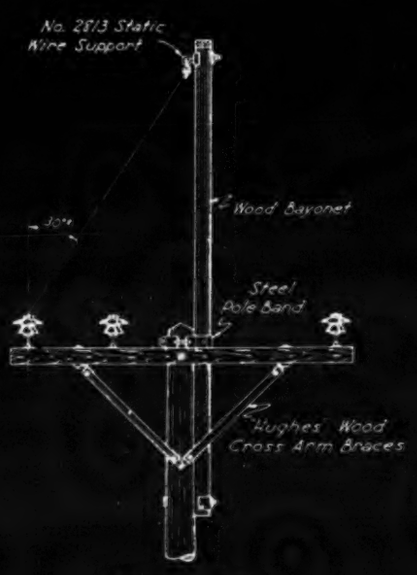
Patent No. 20,096



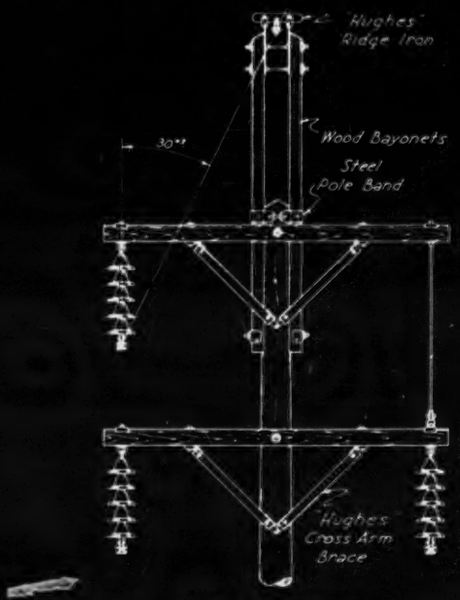
Headquarters for CONNECTORS

Burndy

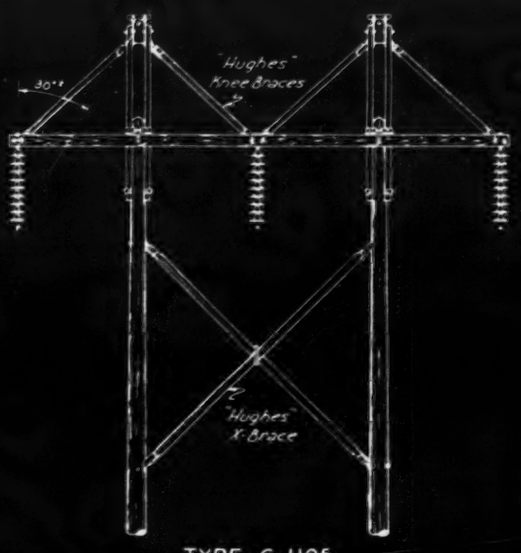
HUGHES WOOD BAYONETS



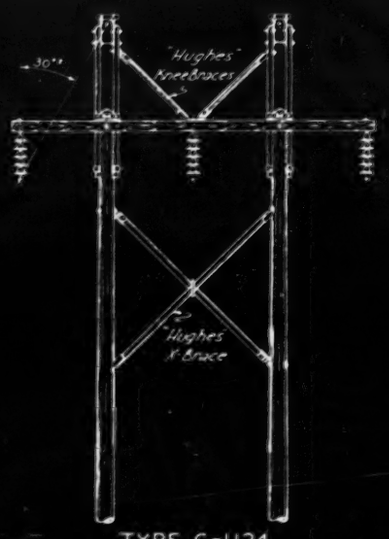
TYPE A-669
SINGLE MEMBER CONSTRUCTION



TYPE B-356-B
DOUBLE MEMBER CONSTRUCTION



TYPE C-1105
FOR POLE & PHASE SPACING OVER 12'-0"
(66 - 110 - 132 - 154 KV.)



TYPE C-1124
FOR POLE & PHASE SPACING UNDER 12'-0"
(44 - 66 - 110 KV.)

"HUGHES WOOD BAYONETS FOR IMPROVING OPERATING RECORDS"

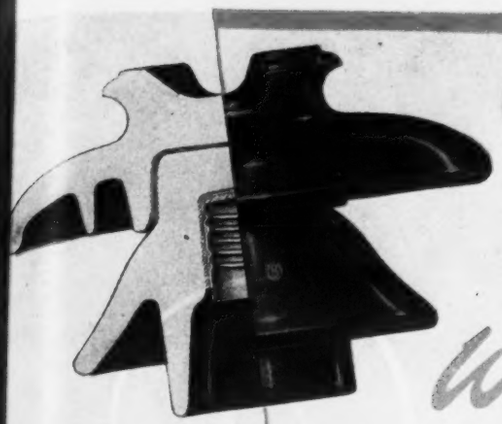
"Hughes" Wood Bayonets properly locate Shield Wires for maximum protection against outage due to lightning. The above examples illustrate only a few of the possibilities, many alternate designs are available. Consult "Hughes" Engineers for additional designs, engineering or full size test data.

Write for Catalog 10

HUGHES BROTHERS
SEWARD NEBRASKA

"HUGHES" TRANSMISSION & DISTRIBUTION WOOD METAL MATERIAL MEN

Write for Bulletin 15



PINTYPES STAND ALONE IN THE O-B FACTORY

because they must

Work Alone ON YOUR SYSTEM!

Does a common pintype insulator lead an easy life? Just consider these facts for a moment:

(1) It usually operates without protective ground wire shielding--an open target for lightning discharges. Under direct stroke, it must withstand full lightning voltage until flashover occurs. (2) It is a single, self-contained dielectric unit interposed between line and ground. It is either all good or all bad. (3) Because of isolated locations and the nature of most lines, inspection and line maintenance are as infrequent as possible.

It takes a *good* insulator to perform year after year under such conditions. If any insulator approaches perfection, that one should be a pintype.

These difficult requirements have been considered by O-B. Pintypes bearing the "O-B" name are made as well as we know how to build an insulator--they are no "poor relative" of a more spectacular and more costly line. They stand alone in our factory, because they must work alone on your system!

Maybe you never quite thought of a pintype this way, but thinking like this has been embodied in O-B pintypes for many years. It helps account for their fine performance record--a record that you can duplicate if you specify O-B.

KEEP BUYING WAR BONDS

THE CLAMPTOP

Saves time and tie wires. Eliminates radio interference resulting from tie wires. Easily worked hot.

2500-H

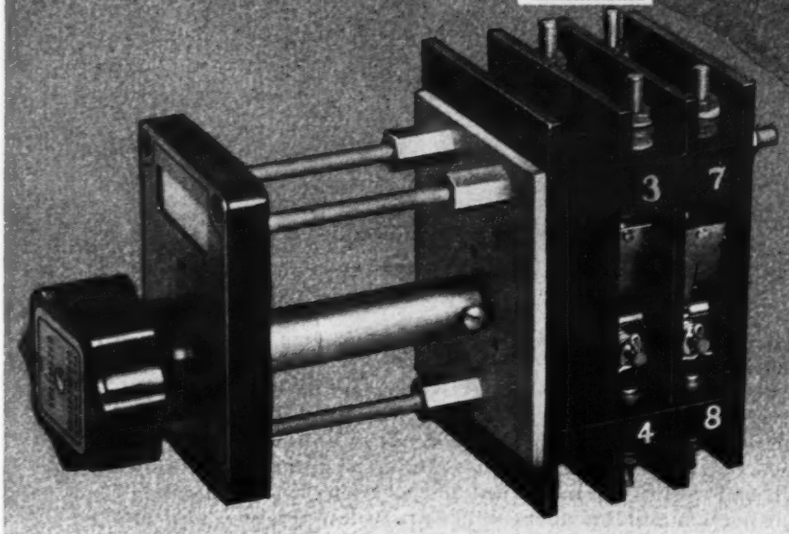
Ohio Brass

MANSFIELD, OHIO

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

1 + 1 = 3

INSTRUMENT + ROTARY SWITCH = 3 INSTRUMENTS



Roller-Smith Type R-2 Rotary Instrument Switches on your switchboard panels will multiply the usefulness of instruments by making one do the work of several. For example, one ammeter connected through an ammeter switch can be used to read each phase of a 3-phase circuit, thereby saving two ammeters. Or one voltmeter can be used to measure as many as seven different circuits simply by turning the rotary switch.

Type R-2 Rotary Switches have bodies of unit construction with molded Bakelite for contact housings. Contact arms are silver plated brass, and contact points are silver buttons, riveted to the arms. Compression springs carry no current and assure ample contact pressure. Dust and dirt will not affect operation of the switch because contacts operate in a vertical position.

Standard Type R-2 Rotary Switches are available in 88 combinations. Special switches can be readily built to your requirements. Bulletin 1740, virtually a textbook on instrument and control switches, includes complete technical data for all Type R-2 Rotary Switches—Instrument, Control, Auxiliary and Transfer—with diagrams of connections, switch developments and many application recommendations. Send for your copy today.

ROLLER SMITH

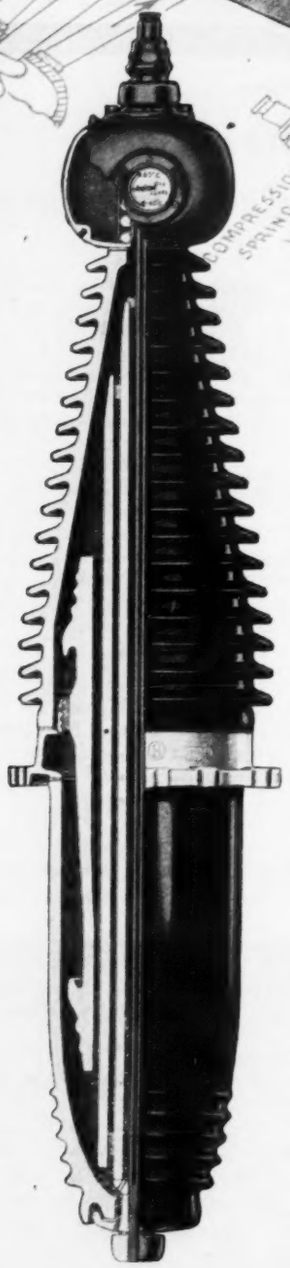
Sales Representatives In all Principal Cities

ROLLER-SMITH BETHLEHEM, PENNA.

Canadian Plant: ROLLER-SMITH MARSLAND, LTD., Kitchener, Ontario

STANDARD AND PRECISION ELECTRICAL INSTRUMENTS • AIRCRAFT INSTRUMENTS • SWITCHGEAR • AIR AND OIL CIRCUIT BREAKERS • ROTARY SWITCHES • RELAYS • PRECISION BALANCES

THE VITAL MECHANICAL SIDE . . .



--OF BUSHING PERFORMANCE HAS BEEN CONSIDERED IN O-B DESIGN

A bushing has too much mass to permit rigid assembly of parts into a solid unit. Relief must be provided. O-B pioneered in this idea fifteen years ago with the introduction of compression spring assembly that has since been broadly applied to bushing design...In O-B bushings, all parts are held together by the pressure of a massive spring acting on the central conductor. Slight resiliency is provided in the event of some severe shock. Destructive forces of expansion and contraction are harmlessly absorbed. Metal and porcelain--one much stronger than the other and varying widely in their reaction to heat and cold--do not work in opposition in O-B's design. Gaskets work within a pre-determined load range, un-affected appreciably by expansion and contraction forces...O-B compression spring assembly makes these bushings as reliable and trouble-free mechanically as they are electrically. Take advantage of this design by specifying O-B.

Ohio Brass

MANSFIELD, OHIO

CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

2498-H

Frigidaire announces great new helps for Frigidaire Servicing Dealers . . . and their Servicemen!

FOR FRIGIDAIRE DEALERS:

A Brand-new Operating Guide covering all phases of Service Department Management is now available to Frigidaire Dealers. Produced by a special staff of Service experts after months of research and field checks, this Guide is a complete digest of proved operating practices.

This Operating Guide is the combined result of 25 years' experience by Frigidaire and thousands of successful Frigidaire Servicing Dealers. It gives authoritative answers to such important questions as:

What shop equipment does a Servicing Dealer need?

How do you determine the number of Servicemen required?

How can accessory sales be stimulated?

How can Service records be used to bring extra profits?

What 21 things can Servicemen do to build goodwill?

How should Service charges be established?

These are only a few of hundreds of important questions answered in this Operating Guide which stands alone in the industry for the help it gives Frigidaire Dealers in stepping up profits and building goodwill through better Service operations!

Another Field-tested Preventive Service Program answering for Frigidaire Dealers that old problem: How to "spread the work" so a Service organization can be kept intact and busy the whole year 'round. Frigidaire's new Fall and Winter Service Program includes a proved plan for utilizing the "off-season" to provide service for essential refrigeration equipment and help relieve hot weather "peaks" . . . contains valuable suggestions for improving Service operations through training aids.

FOR FRIGIDAIRE SERVICEMEN:

New Advanced Service Training for the hundreds of Servicemen who have supplemented Frigidaire's Primary Service Training Course with on-the-job experience. Five days of intensive instruction in all phases of Service work. Courses in all 45 Frigidaire districts, conducted by a staff of skilled instructors using methods developed by Frigidaire experts in Service and Service-training.

Unique "Viso-Trainer"! Based on a device used for years in Frigidaire factory Service-training, VISO-TRAINERS are on the job this winter in all Frigidaire districts, helping Servicemen enrolled in advanced training courses. As Service-trainees adjust the switches, set the controls, and read the gauges on this unusual mechanism, they actually see what happens inside its transparent glass cooling unit. With the VISO-TRAINER, Service-trainees learn the technical aspects of refrigeration quickly, accurately, and thoroughly.

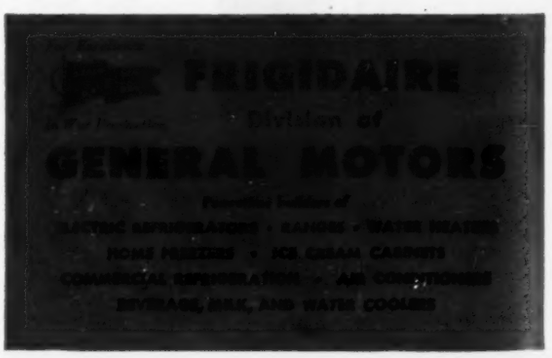
This Card is a Diploma, too: It assures customers that the Serviceman who carries it has finished Frigidaire's Advanced Training Course. Slips into pocket or billfold, bears the Serviceman's picture—gives him added satisfaction in completion of advanced training.

Training for Beginners, and for Post-Graduates. Frigidaire's Primary Training Course, for instruction of inexperienced Servicemen. Correspondence "post-graduate" courses for Servicemen who want a final polish to their knowledge.

Many Other Training Helps. 9 tested Training Films. 3 handy Reference Guides: pocket-size, illustrated, covering most-common Service problems. Service Manuals covering all Frigidaire products. Goodwill Talking Film, Service Call Clerk Manual.

Help and guidance for Frigidaire Dealers in every phase of their Service operations . . . effective training for their Servicemen—these are just two of the important ways Frigidaire is helping Dealers build for—*A bigger and brighter future with Frigidaire!*

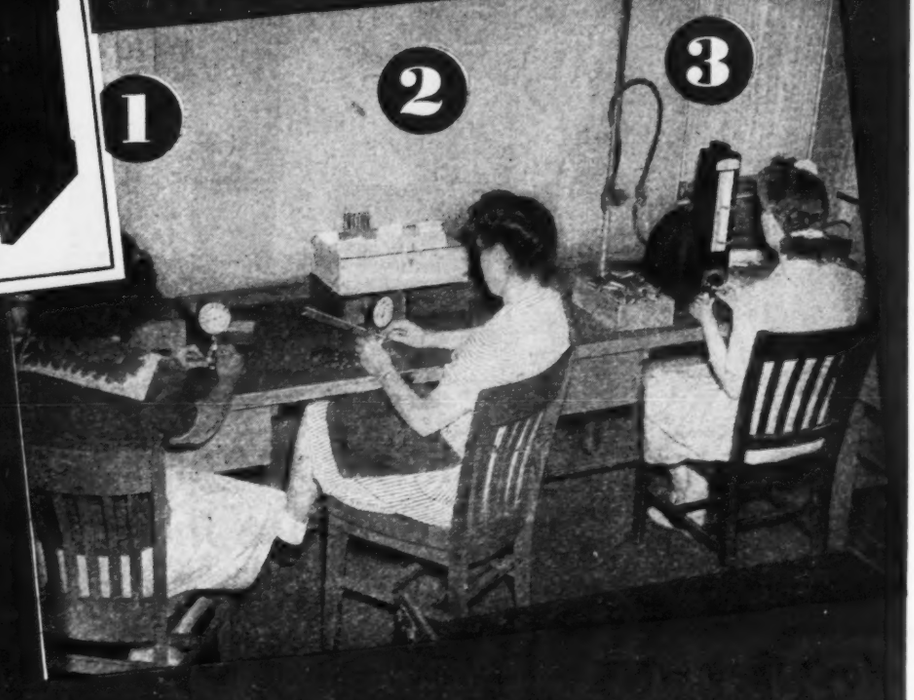
Listen to the
GENERAL MOTORS SYMPHONY OF THE AIR
Every Sunday Afternoon, NBC Network



Constant and Rigid

INSPECTION of HEINEMANN

MAGNETIC CIRCUIT BREAKERS



1 *Unit is inspecting part of one hour overload test for accuracy of tension.*

2 *Unit is inspecting contact gap for amount of deflection under a given load.*

3 *Unit is being set up to inspect time-delay value for correct hold. Duration.*

Means Positive, Unvarying

PROTECTION

FOR YOUR EQUIPMENT

HEINEMANN CIRCUIT BREAKERS employ an overload trip unit that is FULLY ELECTRO-MAGNETIC. Short circuits and dangerous overloads open the breaker instantly, while trip is delayed on momentary harmless overloads. They are vibration- and shock-resisting.

You may have complete confidence in the positive operation of your HEINEMANN Circuit Breaker. Our Quality Control Department is responsible for production of parts and assemblies according to rigid specifications set up by our customers as well as our own Engineering Department.

Process Inspection on sub-assemblies and final assemblies consists of raw material, parts, finish and workmanship inspection. The completed Circuit Breaker then passes a final test insuring a finished product worthy of the HEINEMANN label.

HEINEMANN CIRCUIT BREAKER CO.

Subsidiary of Heinemann Electric Co., Established 1888

103 PLUM STREET, TRENTON, N. J.

"I like to work with Miller Troffers because *they* work with *us!*"

In the fluorescent lighting of schools, offices, stores and industry . . .

new lighting systems need not present new planning problems nor new construction problems. In fact, the Miller 2-lamp 40-watt Fluorescent Troffer not only avoids *new* problems—but ingeniously solves a few *old* ones!

ARCHITECTS SAY that Miller Troffers in single units, combinations of units, or in continuous light-strips "by the mile" present almost unlimited application possibilities. The wide range of plastic and glass dishes, ribbed or fluted—and prismatic glass plates—and grills of metal or plastic—harmonize with almost any type interior.

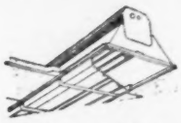
BUILDERS AND CONTRACTORS SAY that exclusive Miller features such as continuous wireway channels (just like in Miller Industrial 50 and 100 foot Candlers), patented brackets and other improvements developed during Miller's 100 years of pioneering make this the most practicable and economical fixture with which to work.

USERS of Miller Troffers say they are amazingly simple to service—and so economical to operate that completely new standards of illumination can be enjoyed.

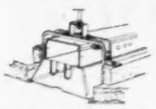
THE MILLER COMPANY SAYS: "We think we've got the best dawgone fluorescent lighting systems in the world—and because we work with all light sources (including mercury-vapor and incandescent), we don't think we're particularly biased."

So call in a Miller Engineer—they're in principal cities — and see why we're starting our *second* 100 years so chock-full of confidence!

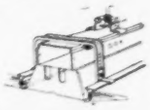
How they work:



Miller Troffer recessed in either plaster or acoustic tile ceiling.



Patented Miller Bracket for attaching to structural ceiling, allowing false wood ceiling to be hung *from the fixture.*



Patented Miller Bracket for attaching to structural ceiling, allowing false metal ceiling to be hung *from the fixture.*

THE MILLER COMPANY • MERIDEN, CONNECTICUT

ILLUMINATING DIVISION
Fluorescent, Incandescent
Mercury Lighting Equipment

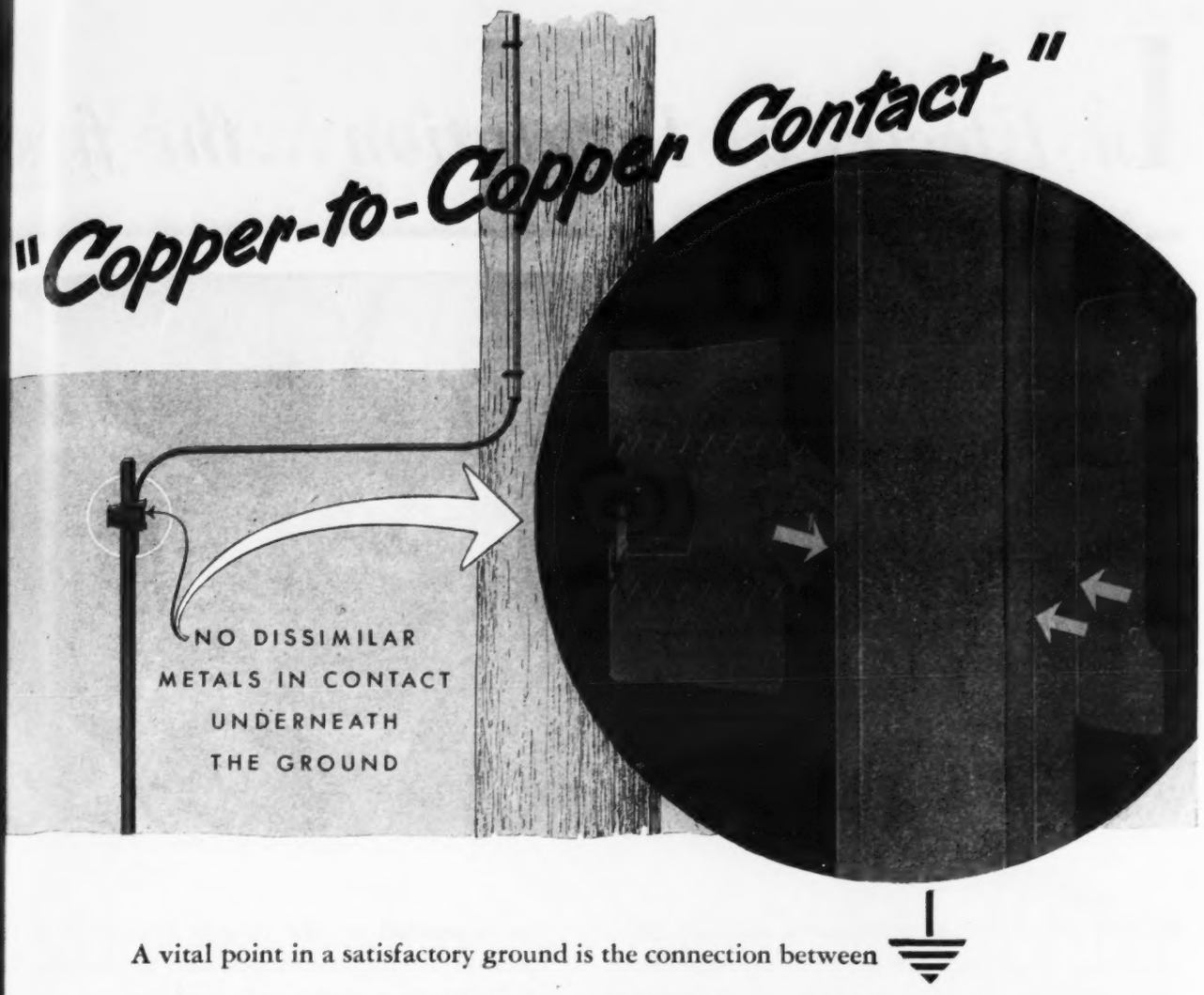
OIL GOODS DIVISION
Domestic Oil Burners
and Liquid Fuel Devices

ROLLING MILL DIVISION
Phosphor Bronze and Brass
in Sheets, Strips and Rolls

WAR CONTRACTS DIVISION
War Materiel

MILLER
SINCE 1844

"Copper-to-Copper Contact"



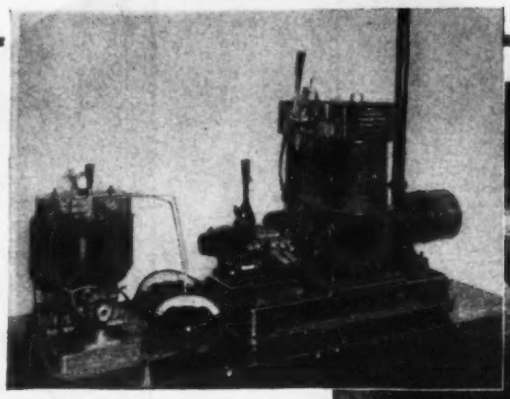
A vital point in a satisfactory ground is the connection between ground wire and ground rod. When a copper grounding wire is clamped to a Copperweld rod the connection is copper-to-copper. There are no dissimilar metals in contact under the ground to cause galvanic action or electrolytic corrosion. For ground connections that are permanently safe and dependable, specify Copperweld non-rusting ground rods—made by Copperweld Steel Company, Glassport, Pa.

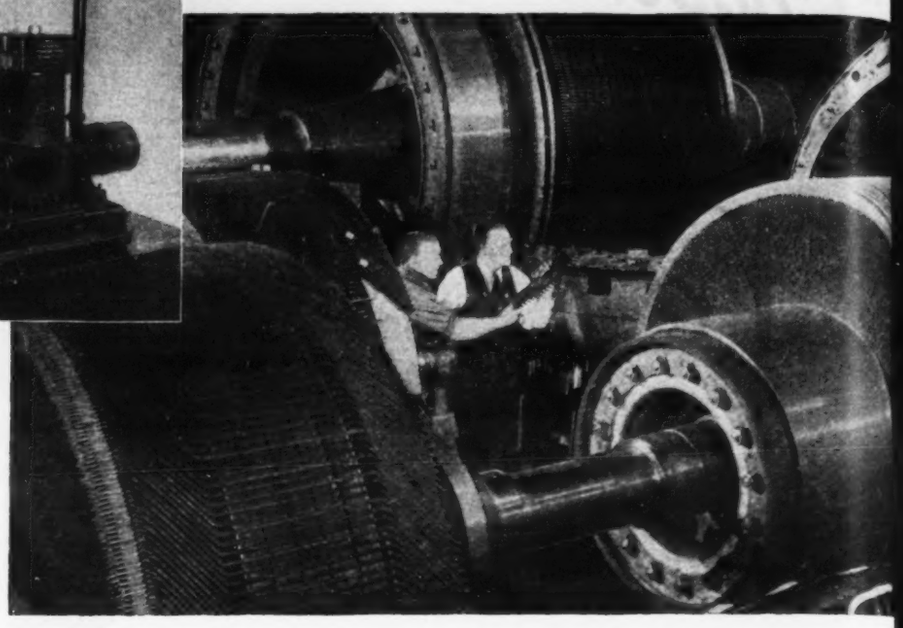
Copperweld NON-RUSTING **GROUND RODS AND CLAMPS**

NATIONAL SALES AGENT:

HUBBARD AND COMPANY PITTSBURGH, PA.

In Electrical Insulation...the firs





Above: One of the earliest Edison by-polar generators—now on display at the Mica Insulator Company plant in Schenectady. It is still in operating condition.

Electrically powered equipment and the Mica Insulator Company have grown up together... and it's a far cry from our first manufactured insulation to the multiple materials we're producing today. During the fifty years of our business existence, virtually the entire span of electrical history is encompassed... from the early Edison bi-polar generators (for which we made sheet mica insulation) to the gigantic turbo-driven jobs of today and tomorrow. Since 1894, our birth date, electricity has stretched its slender tentacles to the farthest corners of the country. It has powered the growth of our industrial stature and nurtured the evolution of the electronic wonder world. No longer earth-bound, it soars the skies and sails the seas... it flings Man's voice, Man's philosophies, his music and now his image, full around the world. And every step of the path, faltering or fleeting, has depended on the *certain* sheathing of th insulation which harnesses and guides the flo of electrical energy.

Our job—small but important—has been t keep pace with the constant flux and growth o the electrical world, and to provide dependabl insulation—designed and made for each pro gressive stage in electrical development. And while it's pleasant to realize that we've done tha job, mere age or past privileges are not temptin Mica Insulator Company to sit back and regar its laurels. We're too impressed with the need o keeping ready our every resource for the jo ahead. Electrical manufacturing, electronics communications, public utilities—even repai and maintenance fields will need new insulation —fabricated with the care and craftsmanship that comes only with experience. Mica Insulato Company's job therefore, lies ahead!

MICA INSULATOR

half hundred years were the hardest

A SINGLE SUPPLY SOURCE FOR DIVERSIFIED INSULATION MATERIALS

MUNSELL MICA

MICANITE REG. U. S. PAT. OFF. Built-Up Mica

LAMICOID REG. U. S. PAT. OFF. Laminated Plastics

EMPIRE REG. U. S. PAT. OFF. Varnished Cloths and Tapes

MICO REG. U. S. PAT. OFF. Insulating Specialties

lica Insulator Company offers to the electrical industry today a ingle supply source for a completely rounded line of insulations, oth in standard form and made-to-specification. Branch offices, istributors and fabricators are strategically located in industrial enters from coast to coast, providing fast service on fabrication nd delivery of special parts . . . as well as expert assistance r consultation on problems affecting insulating materials.

Manufacturers and designers now planning postwar products e invited to investigate, through our nearest sales office, the dvantages to be obtained by utilizing the fifty years of insula- ion experience which is ours . . . and yours for the asking.

FABRICATORS

NEW YORK 14, N. Y., Mica Insulator Company, 200 Varick St.
NEW YORK 3, N. Y., Insulating Fabricators Inc., 12 E. 12th St.
S. BOSTON 27, Mass., Insulating Fabricators of New England, Inc., 22 Elkins St.
CHICAGO 51, Ill., Lamicoid Fabricators, Inc., 3600 Potomac Ave.
CLEVELAND 7, Ohio, The Kirby Company, 13000 Athens Ave.
HOUSTON 10, Tex., Bakoring, Inc., 1020 Houston Ave.

BRANCH OFFICES

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DETROIT: 285 Columbus Avenue • CINCINNATI: 3403 Hazelwood Avenue

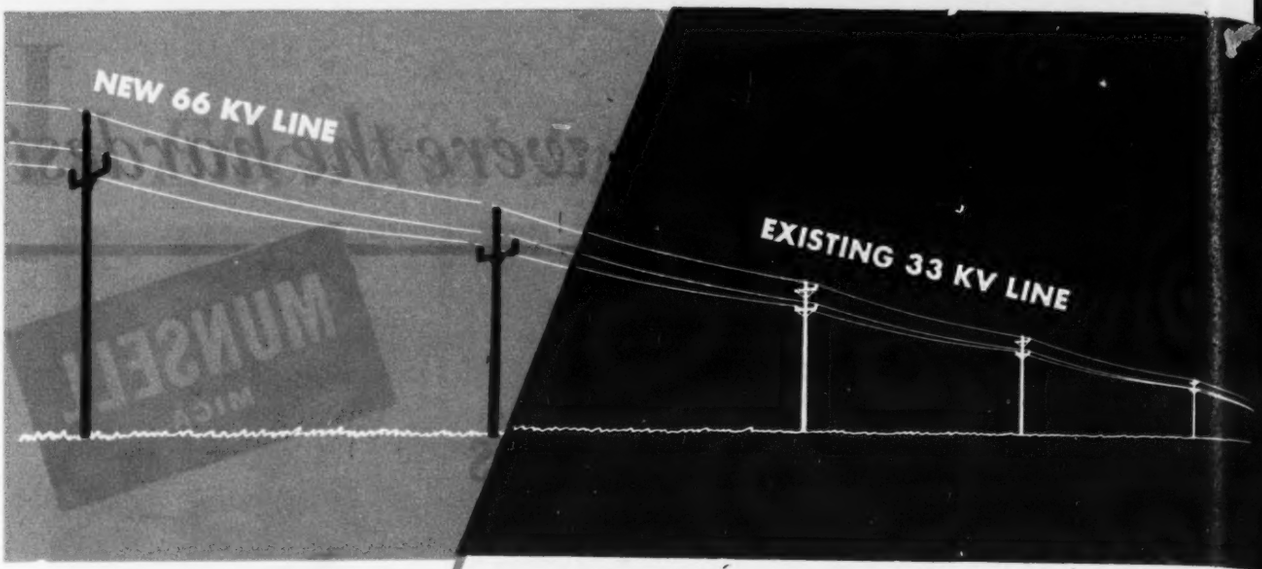
Sales Representatives:
BAKORING, INC.: 1020 Houston Avenue, Houston 10, Texas

THE TRIANGLE PACIFIC COMPANY

SAN FRANCISCO: 1045 Bryant Street • SEATTLE: 95 Connecticut Street
LOS ANGELES: 340 Azusa Street

COMPANY

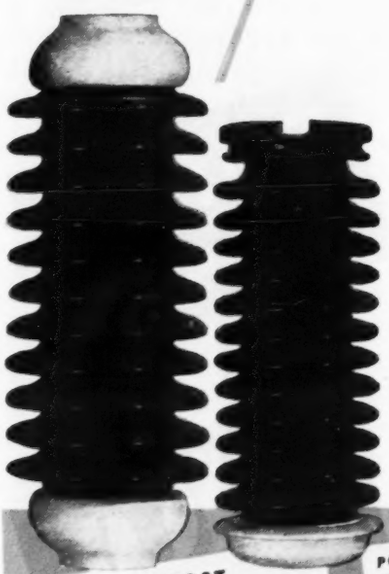
200 VARICK STREET, NEW YORK 14, N. Y.



LINE CONVERSION WITH LAPP LINE POSTS

is the fastest way to fortify your system.... and uses least materials

New or increased load demands frequently can most efficient be handled by conversion of existing lines to higher voltag For this job, Lapp Line Posts are particularly suited. Usin present sound poles and conductors, conversion to highe voltages can be accomplished with no more than new cross arms and Lapp Line Posts. Nor need such construction b considered as an emergency temporary expedient. Such a lin approaches the current ideal for a new line; and your Lap Posts can be expected to give trouble-free service for a longe period of years than you ever got from conventional insulator



LAPP LINE POST and STATION POSTS on your system offer . .

POWER ARCOVER. *Flashover and leakage distances are not appreciably lowered by damage —even loss of several petticoats.*

NO PUNCTURE. *Puncture path in Lapp Post design is as great as flashover path. Insulator will flash over rather than puncture.*

NO CRACKING. *One piece post body, not subject to bursting from tension strains created by thermal changes in nested parts.*

RADIO INTERFERENCE. *By virtue of design factors alone, radio interference is permanently prevented at rated neutral voltage.*

NO CLEANING. *Fog-type design preserves uniform leakage path, prevents leakage flashover, makes the unit "self-cleaning."*

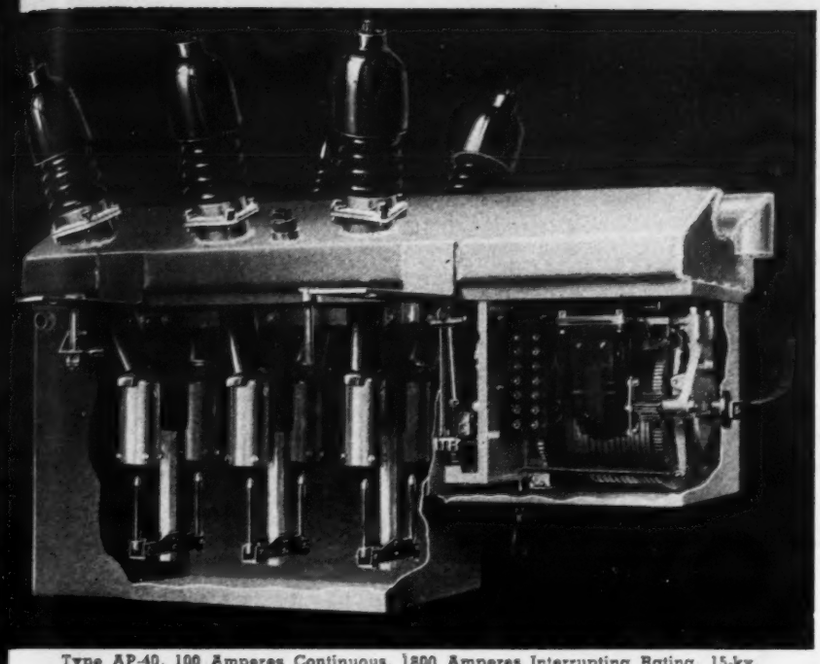
MECHANICAL RUGGEDNESS. *Stones or bullets deflect off, or rupture petticoats, leaving post body intact and insulator secure.*

Lapp

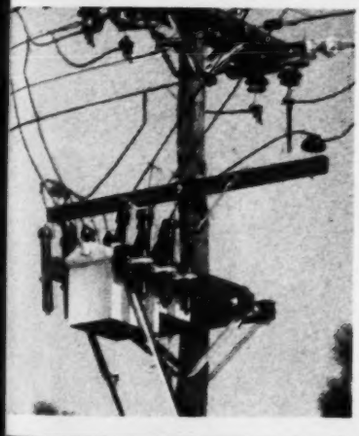
LAPP INSULATOR COMPANY, INC., LE ROY, N. Y.

Why ENDURE OUTAGES

from Transient Faults on Rural or Low-Revenue Distribution Lines!



Type AP-40, 100 Amperes Continuous, 1800 Amperes Interrupting Rating, 15-kv.



Surveys show that 80% of the faults on rural or low-revenue lines are transient and can be *cleared immediately* with the Pacific Electric Automatic Service Restorer.

It is operated by an automatically-prewound spring, providing energy for *clearing any number of transient faults,* as the spring rewinds automatically within a few seconds after each operation.

On sustained faults, lockout occurs on the fourth opening.

The Service Restorer may be set at a choice of reclosing intervals. It has easy outside adjustment of current and tripping time and provision for emergency manual operation.

CLEAR *them* IMMEDIATELY

with the

PACIFIC ELECTRIC

Motor-Rewound Type AP-40

AUTOMATIC SERVICE RESTORER

Equipped with Pacific Electric Expulsion Contacts, arcs clear rapidly, saving both oil and contact wear.

You will want this Pacific Electric Service Restorer to protect your lines, to clear faults immediately, to save on line patrolling and to insure continuity of service. Write for full details.

C. H. CUTTER
1015 Securities Bldg.
Seattle 1, Wash.

G. B. KIRKWOOD
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ANOTHER "WORLD'S LARGES
OUTSTANDING RECOR

165,000 kw. compound unit, one of the world's largest, another of the many outstanding turbine installations lubricated with Gulfcrest Oil.

ST URBINE UNIT MAKING R ITH GULFCREST OIL—

We had such fine performance from Gulfcrest Oil in our 40,000 kw. units

that we put it in service in this 165,000 kw. unit"

"Before we put Gulfcrest Oil in service in our 40,000 kw. turbines, we had sludge trouble and were forced to centrifuge continuously," says this Chief Chemist. "Now we centrifuge only at 6-month intervals, to remove dust and fly-ash. This fine experience with Gulfcrest Oil led to the use of this quality turbine oil in our 165,000 kw. unit—and we're getting the same excellent performance."

Here's the important reason for the outstanding record of Gulfcrest Oil in the turbine systems of hundreds of leading power plants throughout the country: *More thorough and more complete refining!* For in addition to conventional refining methods, Gulfcrest Oil is super-refined by the Gulf Alchlor Process. *Gulfcrest Oil is the world's finest turbine lubricant!*

Call in a Gulf Lubrication Service Engineer and ask him to show you how Gulfcrest Oil can help you get improved lubrication and higher operating efficiency for your turbines. Write, wire, or phone your nearest Gulf office today.

GULF INDUSTRIAL LUBRICATION

GULF OIL CORPORATION
GULF REFINING COMPANY
GULF BUILDING · PITTSBURGH 30, PA.

RECUPERATIVE POWER

A strong heart is always ready to pump hard or idle gently, depending on the action required. When you rest, your heart rests. Upon the recuperative power of the human system depends the length and vigor of life.

Properly designed storage batteries likewise must meet varying power demands and still recuperate. They must do this from the start to the end of their life expectancy.

Gould Plante batteries have this "recuperative" power. Special features like one-piece pure lead positives and dual suspension are your guarantee that a Gould Plante battery will take care of your demands for its entire service life.

Write Dept. 1212 for Catalog 1000 on Gould Sealed-In-Glass Batteries for Stationary Applications.

GOULD

Since 1898 . . . THE BATTERY PICKED BY ENGINEERS

GOULD ELEMENT SUPPORT
for Stationary Batteries

One of a series of informative articles for users of industrial batteries

In the early days of stand by and control operations the Gould Plante and other glass jar batteries, had the elements supported from the opposite edges of each jar and with no cover protection. This was an excellent method for holding the element but the open top allowed acid spray and fumes to escape into the room.

For a time ordinary ribbed glass covers were laid across the top of each battery. This was equally unsatisfactory and after much research and experimentation the present sealed cover was developed.

Sealed covers, however, created problems of element support. Simple bridges on the bottom of the jar were tried but here element growth, which is far from unusual, tended to push the cover up, spoiling the sealing feature. Suspending the elements from the cover was also tried but weight and internal strains resulted in cracked and broken tops.

The Gould *Dual Suspension* of today has developed out of these researches. Essentially it consists of three parts.

(1) Dual Suspension, through which the far sides of all plates are supported by hard rubber channels which, in turn, are carried by the crossbar and terminal post of opposite polarity. This prevents sagging and misalignment of the plates.

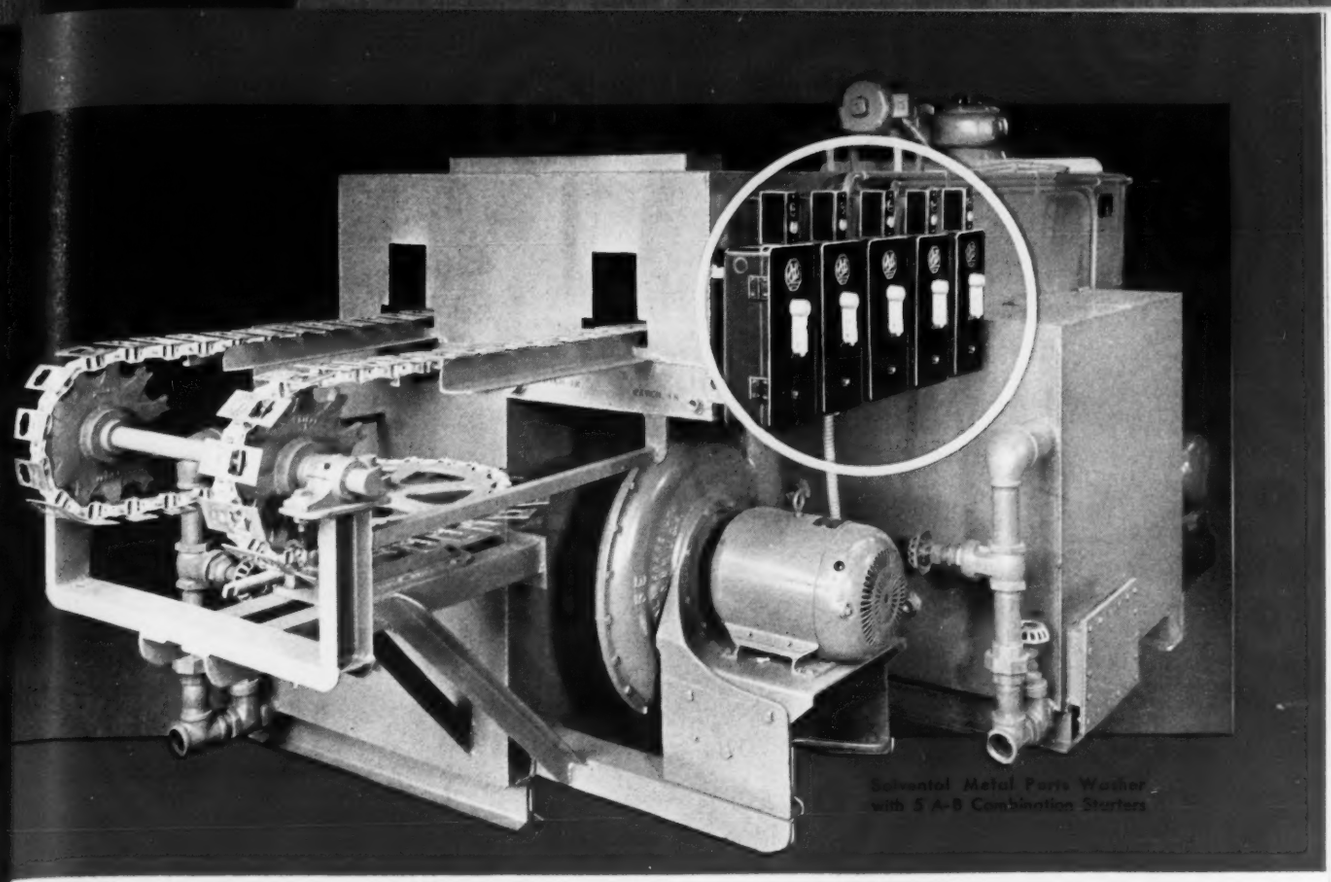
(2) Soft rubber bumpers inserted in the outside negative plates to center and cushion the element in the jar, and making tie-rods unnecessary.

(3) Element Support, or lead projections, cast as an integral part of the terminal post, rest on the top edges of the glass jar and transmit the weight of the element to the walls.

By means of this construction the element is held firmly against warping and buckling, and there is no strain on the cover. Added to other features like the pure lead positive plates it has made Gould Plante the first choice for all stationary applications.

For Excellence in storage battery production at Depew plant

GOULD STORAGE BATTERY CORPORATION, Depew, New York. Factories: Atlanta • Chicago • Dallas • Depew • Jacksonville
Los Angeles • North Bergen • Rock Island • St. Paul • Sioux City • Zanesville



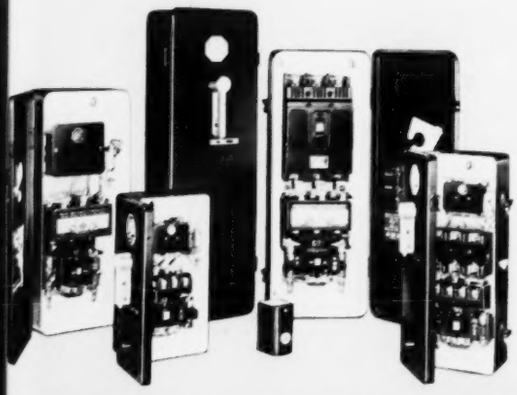
Solventol Metal Parts Washer with 5 A-B Combination Starters

Save Space—Save Wiring—Save Trouble

with A-B Front-Operated Combination Starters

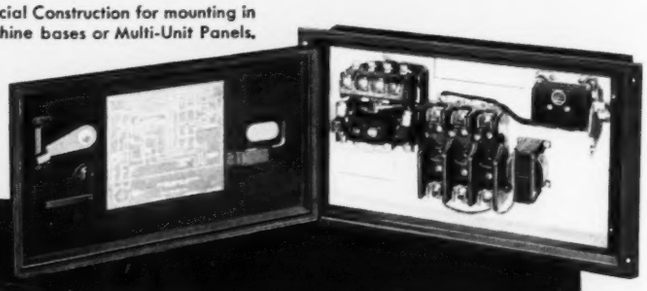
Across-the-line starter and disconnect unit in one cabinet . . . silver alloy contacts on both starter and disconnect switch . . . front-operated disconnect lever . . . these are only a few advantages of Allen-Bradley Bulletin 712 Combination Starters. Available in a variety of enclosures to fit any application.

Write for Bulletin 712 describing these compact solenoid combination starters. They save space, wiring, time, and trouble . . . and they provide added safety, too.



A-B Bulletin 712 and 713 Combination Starters

Special Construction for mounting in machine bases or Multi-Unit Panels.



ALLEN-BRADLEY

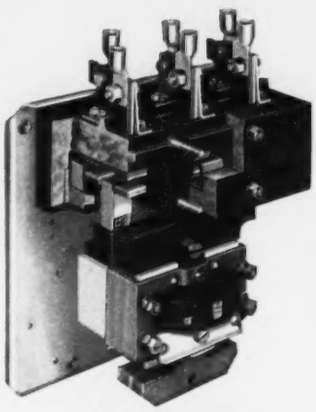
COMBINATION SOLENOID STARTERS

Big or Small

all Bulletin 709 Starters are Solenoid-Operated

The five Allen-Bradley Bulletin 709 solenoid starters, shown below, have been making notable control history for the past ten years.

The first starter, introduced in 1934, was Size 1 for 5 hp., 220 v., 7½ hp., 440-550-600 v. It smashed all performance records of clapper switch starters and, for the first time, made possible precision motor control for machine tools. It set the pattern for modern motor control design and performance.



Sectional view of 150 ampere Bulletin 709 starter showing solenoid plunger, contacts, and terminals, all mounted on steel plate.

Since then, four more sizes have followed, extending the Bulletin 709 line up to 50 hp., 220 v., and 100 hp., 440-550-600 v. In all sizes, the highly successful Allen-Bradley solenoid principle is used. Only one moving part . . . no pins . . . no pivots, hinges, or bearings . . . no contact maintenance . . . no variation in switching performance. No starter is so simple . . . nor so trouble-free.

Unfailing dependability and accuracy in opening and closing of circuits are essentials in machine tool control . . . and Bulletin 709 starters meet these requirements under all service conditions. It will pay you to standardize on A-B controls.

Contacts closed

Only ONE Moving Part

Contacts opened

Allen-Bradley Company
1316 S. Second St., Milwaukee 4, Wis.

ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

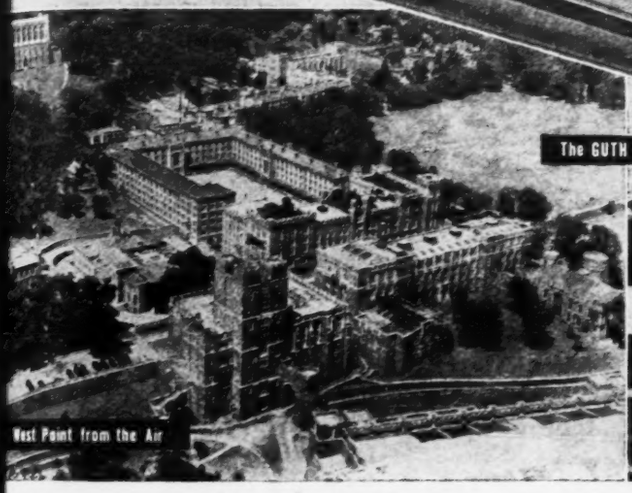
QUALITY

Saluting the GUTH *CADET

* THE FLUORESCENT LIGHTING FIXTURE INSTALLED IN THE UNITED STATES MILITARY ACADEMY AT WEST POINT

Cadets marching to Guard Mount

Cadet Chapel from De Russy Loop



West Point from the Air

The GUTH CADET

Colors during Battalion Parade

West Point Cadets Study by the Light of GUTH "Cadets"

THE study-areas at West Point Military Academy are now lighted by the Guth CADET the new semi-indirect type luminaire.

Forty-five Foot-Candles of uniform, glare-free, shadowless lighting is delivered on the study-desks. The illumination is evenly distributed throughout the area; there are no "Bright-spots"—all brightnesses are correlated. Reading visibility is excellent; writing with either pen or pencil is now effected without any direct or reflected glare. A 100% perfect *seeing-light* has been provided!

The new Guth CADET semi-indirect luminaire, is now Commercially available. Write for details.

THE EDWIN F. GUTH COMPANY
2015 Washington Ave. ST. LOUIS 3, MO.

LIKE THE WEST POINT CADET, THE GUTH CADET IS
Smart in Appearance • Efficient in Action • Developed for Precision • Dependable in Service

BH NON-FRAYING FIBERGLAS SLEEVING

ASSEMBLERS and electricians don't have to be contortionists when working with non-fraying BH *Extra Flexible* Fiberglas Sleeving. Remarkably resistant to stiffening, this always supple insulation won't crack or rot with age. Whether in tough, active service or dead storage, it remains "fresh" and easy to work, retaining its full insulating efficiency *indefinitely*.

This special-processed sleeving won't burn and is non-crystallizing at low temperature. It offers all the natural advantages of Fiberglas—high dielectric and tensile strength—chemical and moisture resistance—and many more—in addition to its own unusual properties.

You'll want to see for yourself the cleaner cutting, non-fraying and non-stiffening features of the sleeving that simplifies assembly, lasts longer and cuts repair costs. BH *Extra Flexible* Fiberglas Sleeving is available in all standard colors. Sizes from No. 20 to 5/8", inclusive. Write for *your* samples today and compare!

BH SPECIAL TREATED FIBERGLAS SLEEVING FLEXIBLE AS STRING!

Here's another high quality BH Fiberglas Sleeving. Due to the BH exclusive process no saturant is used, yet it will not fray out when cut and will withstand heat up to 1200°F. Made in natural color only—all standard sizes. Test it and try it!

BH PRODUCTS

VARNISHED TUBING • SATURATED AND NON-SATURATED SLEEVING

BENTLEY, HARRIS MANUFACTURING CO.

Dept. W Conshohocken, Penna.

WHEN YOU NEED

Motor Control Accessories

consult Westinghouse Buying Data

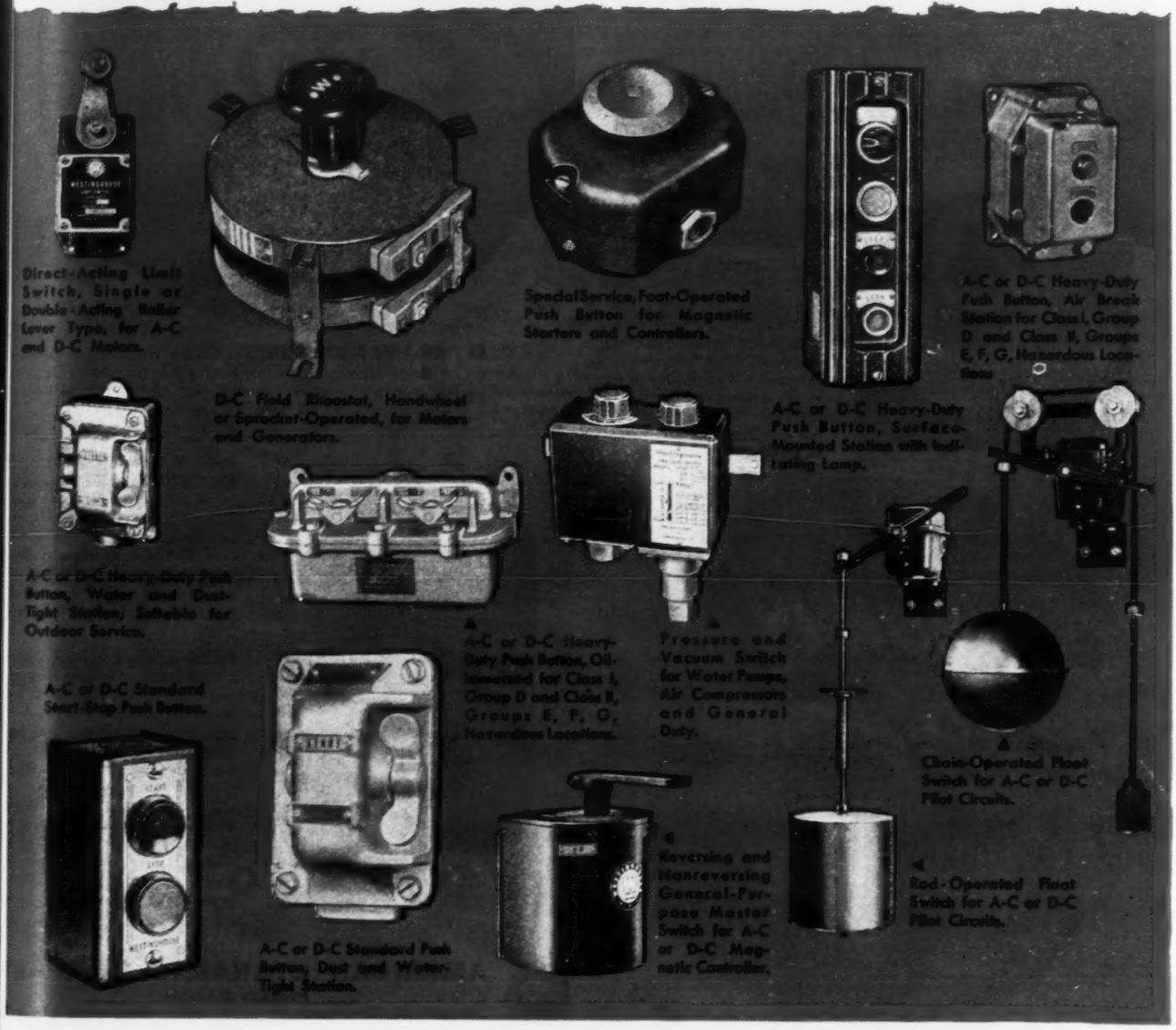
(NEW CATALOG 7000)

With the new Westinghouse Buying Data, you can select and purchase the proper motor control in half the time.

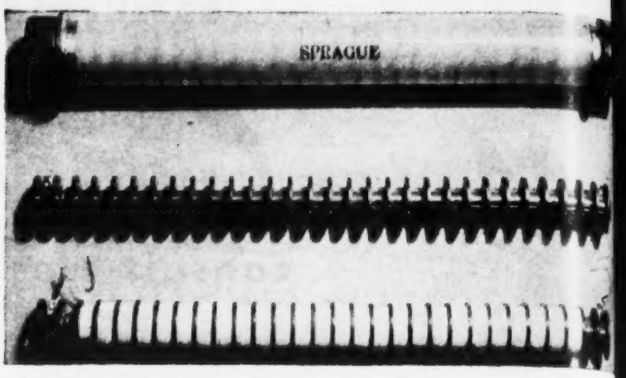
Data, as presented, is striking in its newness. It's easier to read, easier to understand, and easier to use than any published previously by any manufacturer.

Chances are—if you are a buyer of motors and controls—that you have already received a copy of this new Catalog 7000 by mail. However, if you have not received your copy, write, wire or phone your nearest Westinghouse district office. (Requests will be filled through district offices only — no mailing from Westinghouse headquarters at East Pittsburgh.) J-60551

Westinghouse PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE *Control Accessories*

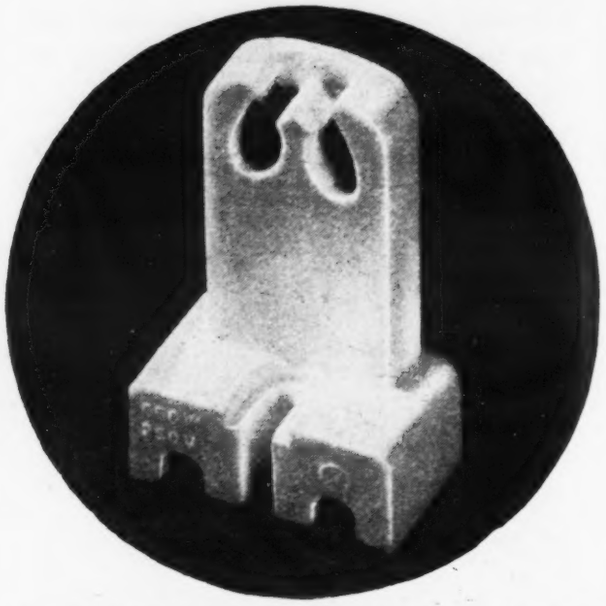

Direct-Acting Limit Switch, Single or Double-Acting Roller Lever Type, for A-C and D-C Motors.
D-C Field Rheostat, Handwheel or Sprocket-Operated, for Motors and Generators.
Special Service, Foot-Operated Push Button for Magnetic Starters and Controllers.
A-C or D-C Heavy-Duty Push Button, Air Break Station for Class I, Group D and Class II, Groups E, F, G, Hazardous Locations
A-C or D-C Heavy-Duty Push Button, Surface-Mounted Station with Indicating Lamp.
A-C or D-C Heavy-Duty Push Button, Water and Dust-Tight Station; Suitable for Outdoor Service.
A-C or D-C Heavy-Duty Push Button, Oil-Immersed for Class I, Group D and Class II, Groups E, F, G, Hazardous Locations.
Pressure and Vacuum Switch for Water Pumps, Air Compressors and General Duty.
Chain-Operated Float Switch for A-C or D-C Pilot Circuits.
A-C or D-C Standard Start-Stop Push Button.
A-C or D-C Standard Push Button, Dust and Water-Tight Station.
Reversing and Nonreversing General-Purpose Master Switch for A-C or D-C Magnetic Controller.
Rod-Operated Float Switch for A-C or D-C Pilot Circuits.

Life ON THE PLASTICS NEWSFRONT



(*Above*) **WIRE-WOUND KOOLOHM RESISTOR CORES** are molded of MELMAC S-6003 for the Sprague Specialties Company. MELMAC's high dielectric strength and mechanical stability at high operating temperatures make it ideal for such electrical applications.

(*Above*) **STURDY, SANITARY TOPS** for thermostatically controlled hot food containers, supplied the Army Air Corps by The Tappan Stove Company, are made of moisture and stain-resistant alpha-cellulose-filled MELMAC by The Watertown Manufacturing Company.



(*Above*) **KULKA TURN-TYPE FLUORESCENT SOCKETS** are molded of BEETLE* by Waterbury Companies, Inc., for the Kulka Electric Mfg. Co., Inc., to assure perfect operation mechanically and electrically. BEETLE's white color is also important in lighting applications.

(*Left*) **A NEW THERMAL TYPE AIR CIRCUIT BREAKER** is molded of MELMAC P-3020 by Kuhn & Jacob and General Electric Company for the I-T-E Circuit Breaker Company since it has the requisite flame and arc resistance, dielectric strength, and heat resistance.

In these applications, and in a multitude of others throughout the industrial field, Cyanamid plastics have proved practical, efficient, and economical. Constant research and development work is carried on to broaden the usefulness and value of plastics in new applications. We will be glad to consult with you on how a Cyanamid plastic can meet your requirements for present or postwar products.

*Reg. U. S. Pat. Off.

Cyanamid Plastics

Beetle · Melmac
Melurac · Laminac
Urac

AMERICAN CYANAMID COMPANY
Plastics Division
30 Rockefeller Plaza · New York 20, N.Y.

Seyler

for

POLE LINE HARDWARE AND CONSTRUCTION SPECIALTIES

● You probably are planning your postwar transmission and distribution line extensions and changeovers. You are also looking ahead to rebuilding depleted inventories.

Seyler Manufacturing Company is ready to supply your pole line hardware needs as soon as government regulations permit.

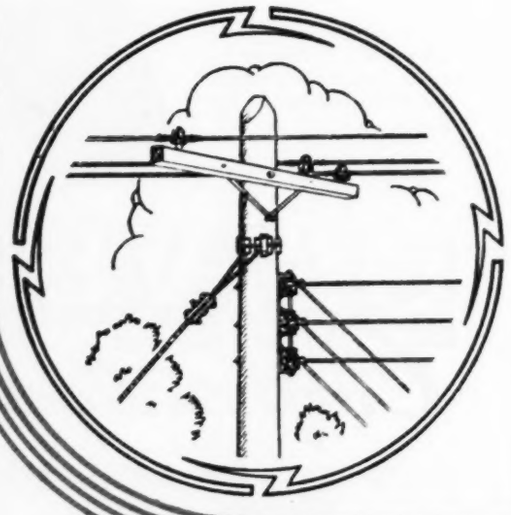
Seyler's war job has been to produce more pole line hardware. We are meeting the vital demands of the U. S. Army Signal Corps. At the same time we are cooperating with the industry to supply your essential needs.

A quick check of hardware purchased during the war will show how well we are doing both jobs.

To help you plan for the line construction work ahead and to assist you in rebuilding inventories we suggest that you send for Seyler Catalog No. 43. You will find it a useful manual for both your design engineers and purchasing department.

Seyler catalog No. 43 contains detailed line drawings for each product. Hardware for both wood and steel construction is included. There is both a stock number index and an index arranged alphabetically by product.

Our engineering department, our sales engineers and our distribution channels are ready to help you.



SEYLER MANUFACTURING COMPANY
BOX 7827, SHARPSBURG, P.O. PITTSBURGH, PA.

Please send me your Catalog No 43.

Name.....

Firm.....Title.....

Address.....

City.....State.....

—from the COMPLETE LINE OF

OLIVER

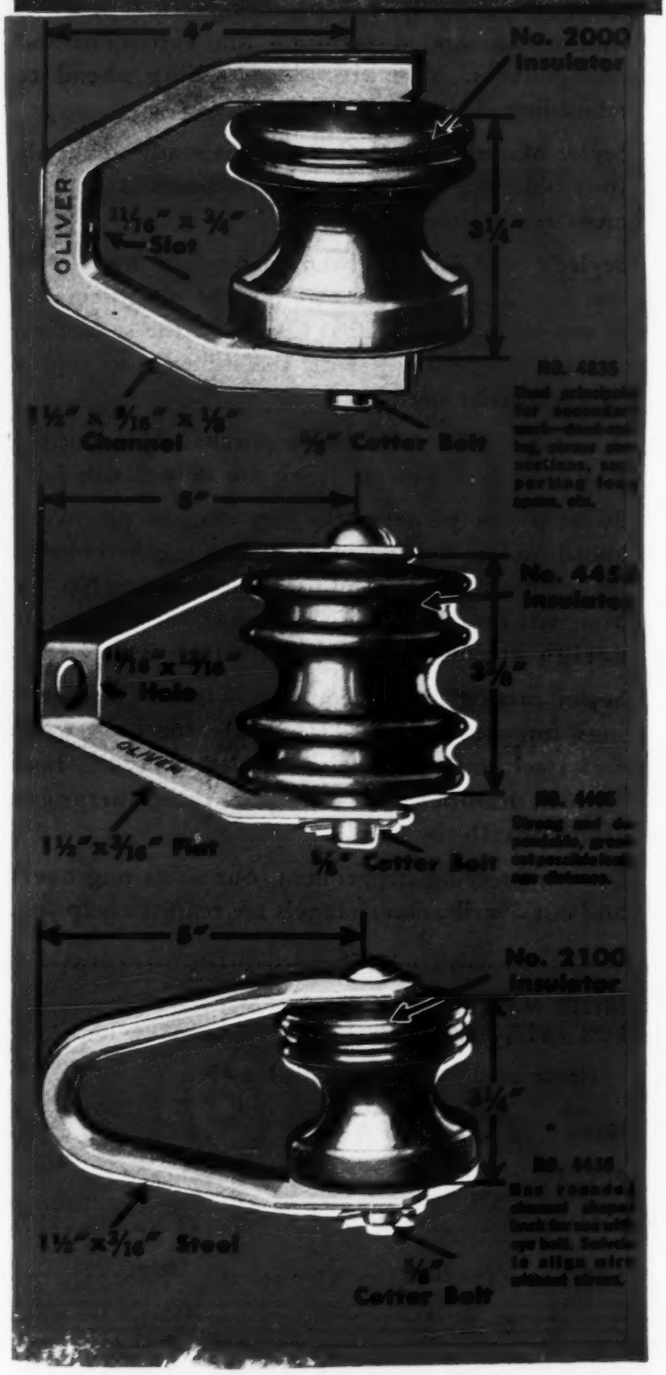
POLE LINE MATERIALS

Clevises

FOR ALL TYPES OF CONSTRUCTION

MECHANICALLY *Strong*
ELECTRICALLY *Efficient*

TYPICAL OLIVER DESIGNS



You have found that the right clevis at the right time makes a neater, better, faster job of erection. Realizing that utility men need a variety of styles of clevises, Oliver has developed a complete line. Are you familiar with them? You will find styles for every type of application—every one designed, built and *service tested* under operating conditions.

They combine great mechanical strength with high electrical efficiency to provide long life and satisfactory service. Porcelain insulators are carefully selected for the job. Metal parts are made from open hearth steel, hot-dip galvanized.

It will pay you to become familiar with these important *economy aids* now!

All Oliver Clevises are described fully in Catalog 43, which covers the complete line of Oliver Pole Line Materials.

OLIVER
IRON AND STEEL
Corporation

SOUTH TENTH AND MURIEL STREETS
PITTSBURGH 3, PA.

Speed

REVOLUTIONARY RADIO TUBE DESIGN WITH D/H METALS

Frequencies of 2000 Megacycles and more—Electronic Heating—Frequency Modulation—Television—Radar . . . these and other phenomenal radio inventions have brought about radical changes in radio tube design like these.

New concepts of tube function and revolutionary methods of construction have necessitated equally new developments in radio metallurgy.

In Driver-Harris research laboratories and factories are being produced the radio alloys essential to the speedy and successful manufacturing of these tubes . . . in quality controlled quantities adequate for the great demands of war.

Whether you are striving to make standard tubes rate higher and last longer—or are engaged in the development of new types, depend on Driver-Harris to supply you with the radio metals required. Send us your metal specifications.

Driver-Harris makes these and other time-tested alloys for every radio and vacuum tube requirement:

***NICHROME** ***GRIDNIC ALLOYS** **NICKEL "A," "D," "E," "Z"**
***FILNIC ALLOYS** **#42 ALLOY** **#52 ALLOY** ***NILVAR**

*Trade Mark Reg. U.S. Pat. Off.

ARMY E NAVY

D/H — SPECIAL PURPOSE ALLOYS SINCE 1893

Driver-Harris COMPANY

HARRISON, NEW JERSEY

BRANCHES: CHICAGO • DETROIT • CLEVELAND • LOS ANGELES • SAN FRANCISCO • SEATTLE

These Ducts
HAVE WHAT IT TAKES
—for reliable cableway service

Here are some outstanding reasons why J-M Transite Conduit and Korduct serve so well under the most severe conditions—

Inorganic . . . made of an asbestos and cement composition which provides permanence and strength, makes the ducts immune to rust or rot.

Permanently smooth bore . . . long cable pulls and replacements are made easier. Danger of damage to cables is minimized.

Easily and quickly installed . . . long, light-weight lengths and simple assembly method assure rapid, economical installation.

Immune to electrolysis . . . being entirely inorganic and non-metallic, these ducts are not affected by electrolytic or galvanic action.

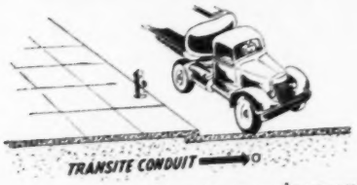
Lower cable temperatures . . . an advantage resulting from a relatively high rate of heat dissipation.

Incombustible . . . won't contribute to the formation of dangerous smoke, gases, or fumes. If burnouts do occur these inorganic ducts provide maximum protection to adjacent cables and permit easy removal of damaged conductor.

* * *

For complete details on Transite Ducts, write for Data Book, DS-410, Johns-Manville, 22 E. 40th St., New York 16, N. Y.

TRANSITE *CONDUIT*

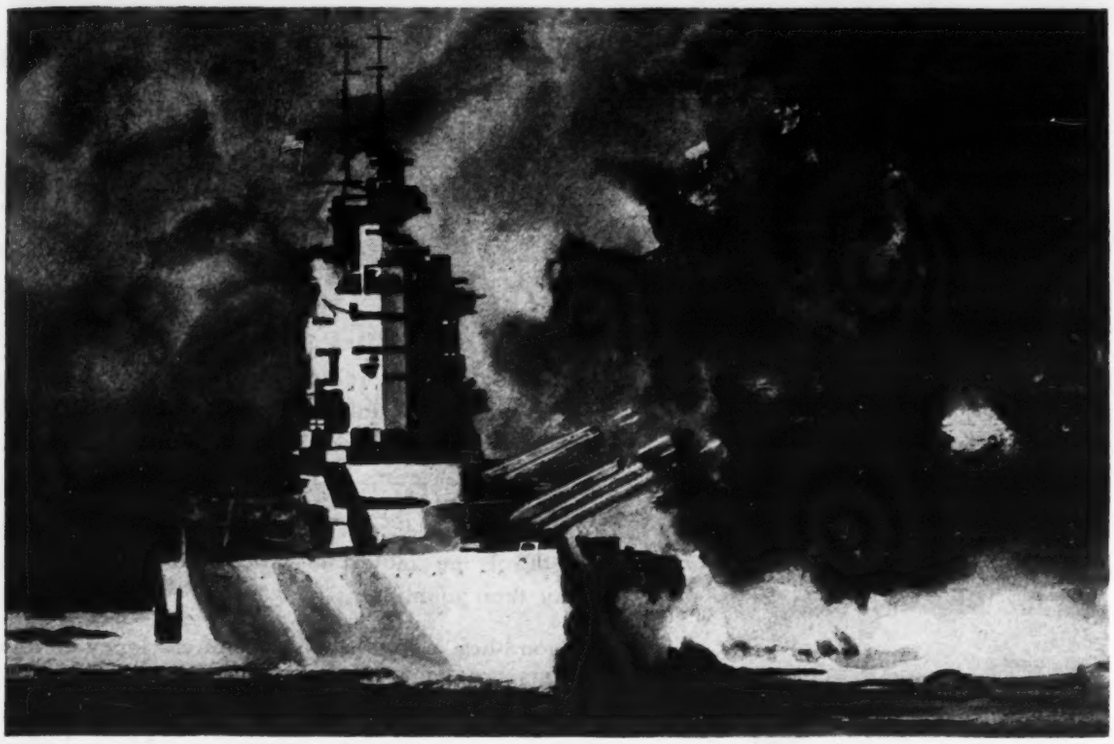


For exposed work and use underground without a concrete encasement.

TRANSITE *KORDUCT*

For installation in concrete. Thinner walled but otherwise identical with Transite Conduit.

JOHNS-MANVILLE ***TRANSITE DUCTS***



TO SAFEGUARD

is also the purpose of Shawmut THERM-A-TRIPS. They protect motors, circuits, and equipment. They avoid needless shutdowns. Their long, safe time-lag allows motors to start and run on normal overloads; but they blow at once on excessive overloads and short circuits. They occupy a small space, are inexpensive, need no attention, can be instantly replaced; and no other overload protection is needed. Three types: knife-blade, ferrule, and plug. Protection with THERM-A-TRIPS is positive protection — the kind you want. Make sure you specify them.

THE CHASE-SHAWMUT COMPANY
NEWBURYPORT, MASSACHUSETTS

FUSE MAKERS SINCE 1893

STRONG, SMOOTH, STABLE.

That's Formica Pregwood!

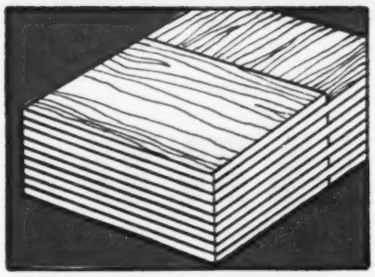
PREGWOOD is a relatively new material possessing many unusual qualities that have adapted it to many uses—such as switch gear in heavy duty switches, picker sticks on textile looms, ski bottoms on military skis.

The test figures shown below indicate the remarkable strength of the material—which has a lower specific gravity than aluminum.

Pregwood has a certain measure of efficiency as an electrical insulator. It is non-absorbent and does not take up moisture. It is chemically inert and can be used for apparatus parts that will be exposed to acids and alkalies.

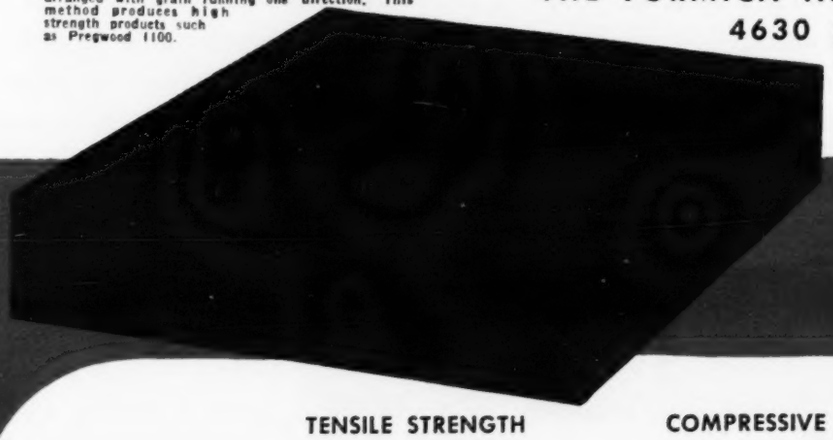
Changes in humidity have relatively little effect on dimensions; and a low co-efficient of thermal expansion holds the material stable under marked changes in temperature.

It has the quality of wearing smoothly without slivering or cracking. This makes it especially desirable for parts of textile machinery where it will not snag threads of fabrics.



Pregwood is built up by impregnating wood laminations with phenolic resins and pressing them together under heat and pressure. The laminations may be arranged with grain running one direction. This method produces high strength products such as Pregwood 1100.

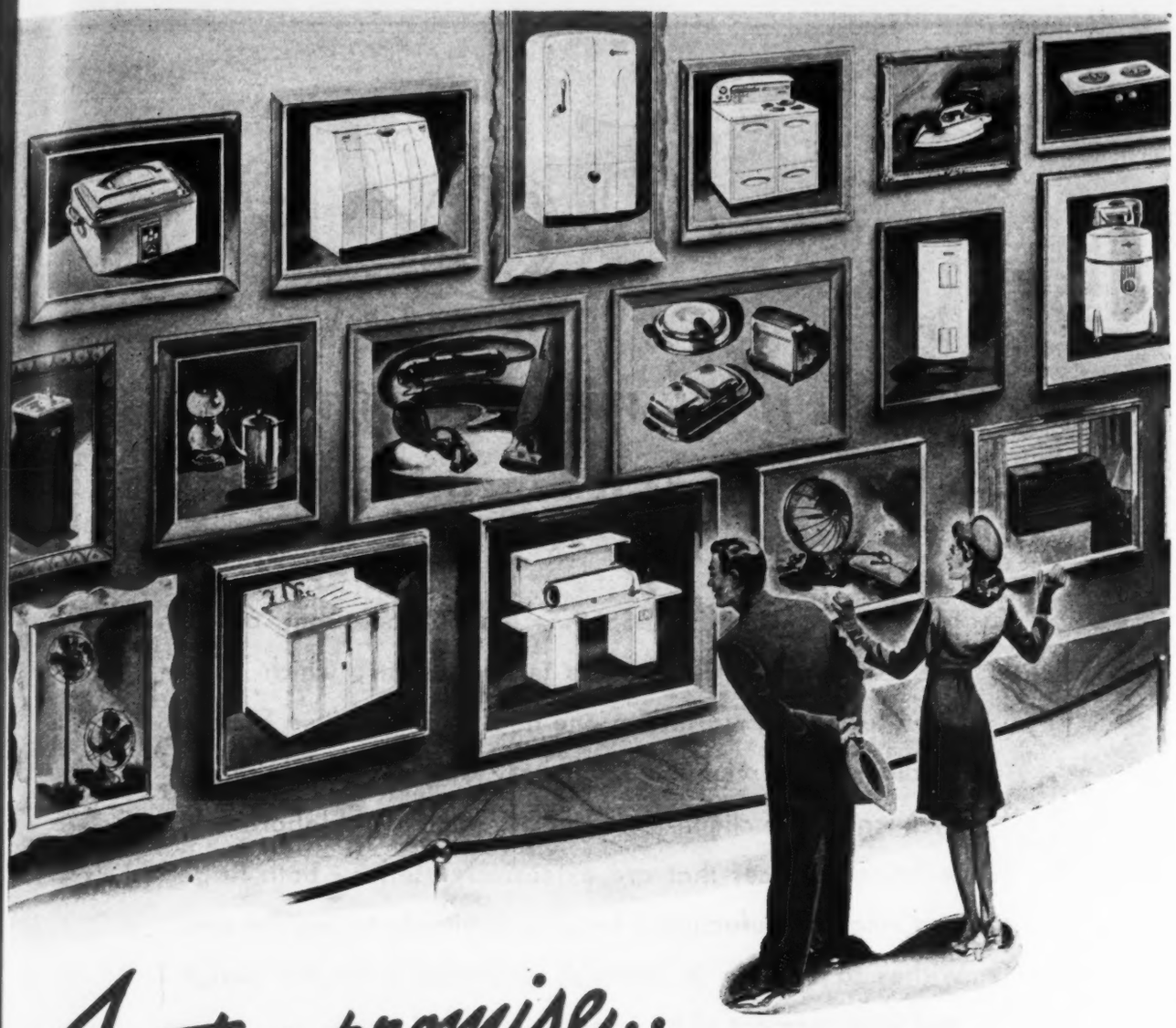
THE FORMICA INSULATION COMPANY
4630 Spring Grove Avenue
CINCINNATI 32, OHIO



	TENSILE STRENGTH	COMPRESSIVE	IZOD IMPACT
	#/sq. in. 30,000	#/sq. in. 20,000	Ft. Lbs./In. Notch Width
PREGWOOD 1100	FLEXURAL #/sq. in. 48,000		Flatwise 7.0 / Edgewise 6.0

Test samples are available on request—

FORMICA



Just a promise..

OF THINGS TO COME!

Here are 22 Westinghouse pre-war appliances
Every one a pacemaker! Every one a profit maker!

But an even greater line is coming. New features, new improvements among the present members of the family. New additions to the line such as . . .

HOME FREEZERS • STEAM IRON
ELECTRIC CLOTHES DRYER

And ready for postwar distribution will be the already familiar Laundromat, a worthy running mate for the famous Westinghouse Refrigerator.

This then will be the Westinghouse postwar line—the line of least resistance.

WESTINGHOUSE ELECTRIC & MANUFACTURING CO.
MANSFIELD, OHIO

30 MILLION PRE-WAR

Westinghouse

ELECTRIC HOME APPLIANCES
ARE YOUR POSTWAR PROMISE
OF STILL FINER ONES TO ~~COME~~ *sell*

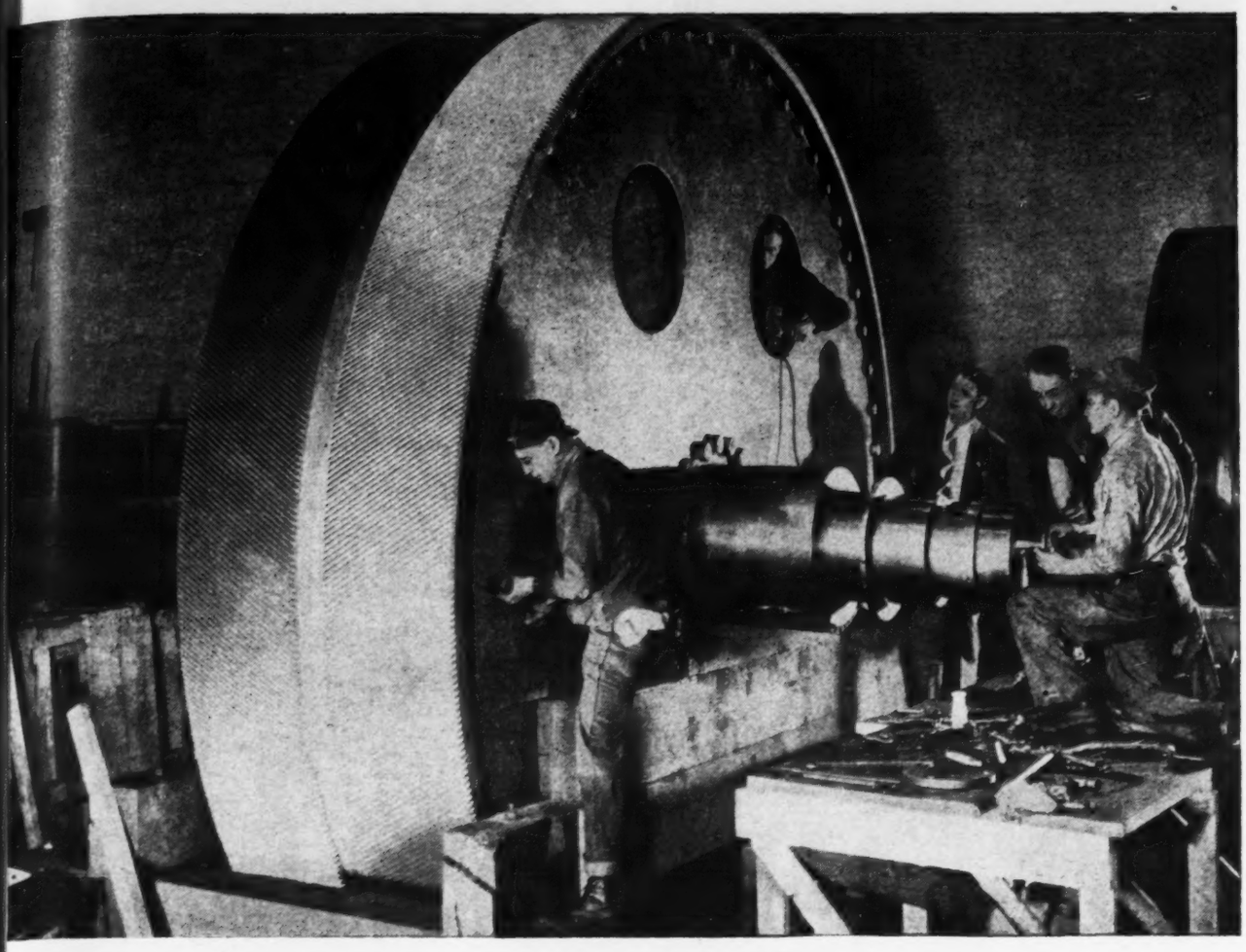
TUNE IN: JOHN CHARLES THOMAS, SUNDAY 2:30 EWT., N. B. C. ★ HEAR TED MALONE, MON., TUES., WED. EVENINGS, BLUE NETWORK

INDEPENDENT LABORATORY SERVICES

TO SMALL BUSINESSES — the 92 per cent of all business establishments in the country which have been furnishing more than one-third of peace-time factory employment — scientific laboratory services are offered. By becoming a client of a selected commercial laboratory, technical services that are extensively used by both large and small manufacturers become available to anyone who wishes to engage in research and testing for the design and improvement of his product.

Any manufacturer who approaches this laboratory will be offered appropriate services if his problem is within the field in which ETL is competent, or will be referred to another laboratory if greater competence in this field exists elsewhere.

· ELECTRICAL ·
TESTING LABORATORIES · INC.
2 EAST END AVENUE AT SEVENTY-NINTH STREET
· NEW YORK 21, NEW YORK ·



Between the Turbine and the Deep Blue Sea

MAIN COG in a 58-ton reduction gear unit, this giant herringbone, 14½ feet in diameter, will be installed in a C-3 cargo ship to gear down speed between turbines and propeller.

Afloat or ashore, all turbines — steam or hydro — require effective lubrication for efficient operation. So, operators everywhere are turning to Texaco.

Texaco Regal Oils (R & O)—a new high in preventing rust and oxidation—keep steam turbine systems clean, bearing temperatures normal, governor action smooth and sensitive. These oils free themselves rapidly from air and water, and are designed to prevent gum formation and sludging.

Texaco lubricants have proved so effective in service they are definitely preferred in many fields, a few of which are listed at the right.

Texaco Lubrication Engineering Service is available to you through more than 2300 Texaco distributing points in the 48 States. The Texas Company, 135 East 42nd Street, New York 17, N. Y.

THEY PREFER TEXACO

★ *More locomotives and railroad cars in the U. S. are lubricated with Texaco than with any other brand.*

★ *More revenue airline miles in the U. S. are flown with Texaco than with any other brand.*

★ *More buses, more bus lines and more bus-miles are lubricated with Texaco than with any other brand.*

★ *More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.*

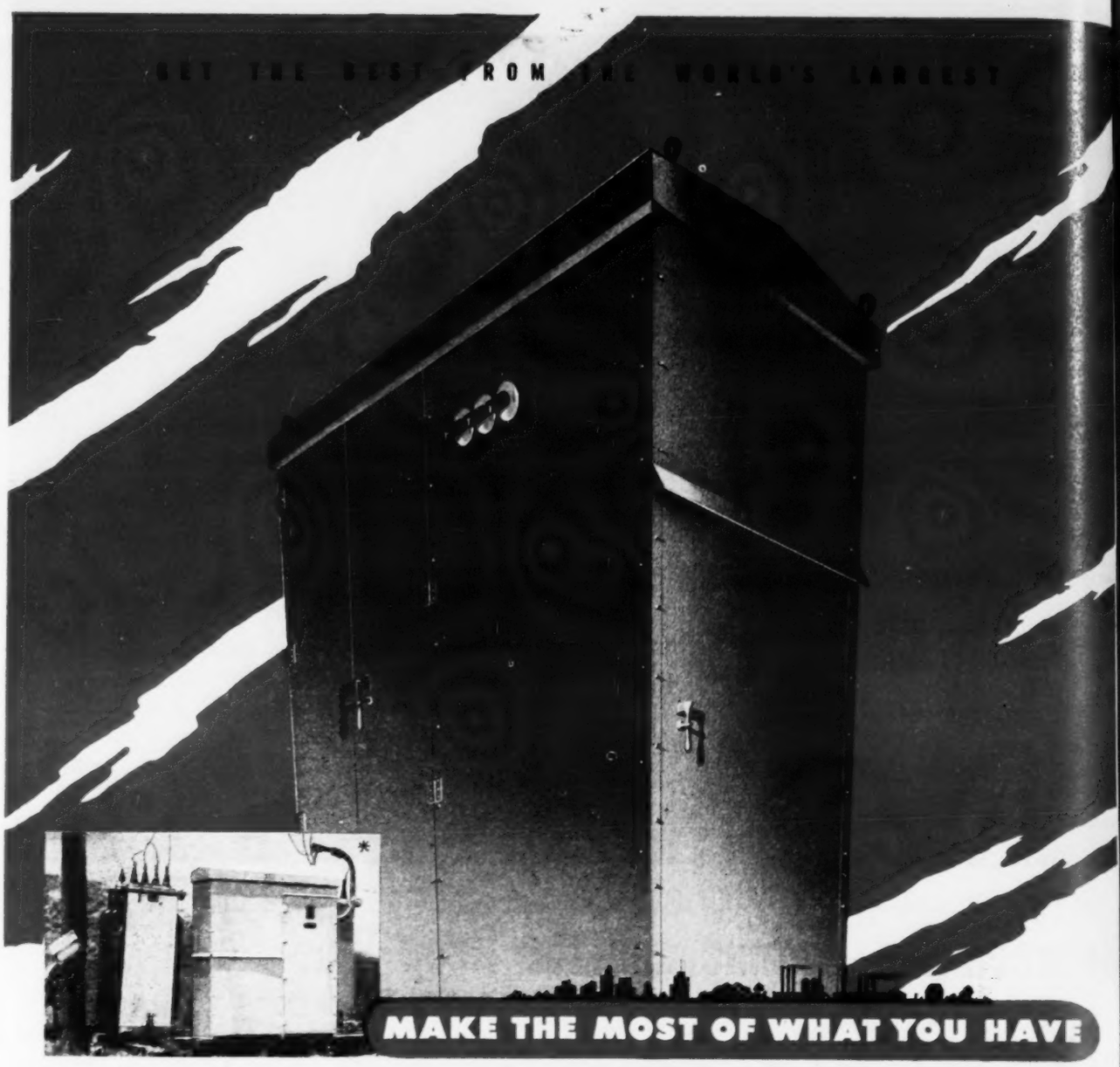
★ *More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.*

TEXACO

TEXACO Regal Oils (R&O)

FOR ALL TURBINES

TUNE IN THE TEXACO STAR THEATRE WITH JAMES MELTON SUNDAY NIGHTS ★ METROPOLITAN OPERA BROADCASTS SATURDAY AFTERNOONS



with C-D Capacitors for Power Factor Improvement

If your plant is suffering from electrical "growing pains" resulting in hot feeders, poor voltage regulation, low power factor, lack of system capacity for new equipment, you may find Cornell-Dubilier Capacitors a simple and efficient cure.

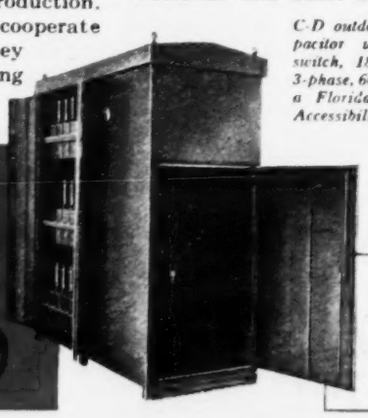
C-D Capacitors are quickly obtained, use a minimum of critical materials and man-hours. They eliminate the necessity of adding new copper. They can be installed without changing system layout or disrupting production. Our engineers will be glad to cooperate with you in making a survey of your plant and estimating your needs. Cornell-Dubilier Electric Corporation, South Plainfield, N. J.

DESIGNED AND BUILT BY SPECIALISTS

C-D outdoor Rack Type Capacitor with fusible safety switch, 180 KVA, 460 volt, 3-phase, 60 cycles—installed at a Florida Phosphate Mine. Accessibility of equipment in cabinet makes inspection easy—and otherwise, practically no maintenance is required.

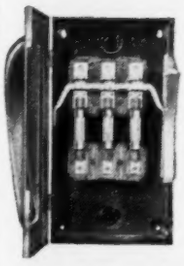
CORNELL-DUBILIER CAPACITORS

FOR POWER FACTOR IMPROVEMENT
CARRIER CURRENT COUPLING
SURGE PROTECTION



540 KVA—2400 Volt—3 phase 60 cycle outdoor capacitor complete with oil circuit breaker.

Distinguished!



Vacu-Break

SAFETY SWITCHES WITH "CLAMPMATIC" CONTACTS

There are many valuable *plus features* in BullDog Safety Switches, but none of them increases the *price you pay.*

There is the exclusive Vacu-Break principle of arc suffocation . . . the Clampmatic feature which assures "on" contacts as tight as a bolted connection . . . and the distinguished style of cabinets which combine modern beauty with extra utility.

Such advantages, backed by the BullDog reputation for invariably fine workmanship, account for the fact that a majority of buyers who insist on the *best* are among BullDog's customers.

Capacities from 30 Amp. to 1200 Amp., 2, 3 and 4 Poles, 575 Volts and less.

Buy More War Bonds

BULLDOG

Buy More War Bonds

ELECTRIC PRODUCTS COMPANY

BOX 177, R. PK. ANNEX, DETROIT 32, MICHIGAN
In Canada: BullDog Electric Products, Ltd., Toronto
Field Engineering Offices in All Principal Cities

Also Manufacturers of
SaftoFuse Panelboards — Switchboards — Circuit Master Breakers—BUStribution Duct, for "plug-in" power—Universal Trol-E-Duct, for flexible lighting — Industrial Trol-E-Duct, for movable "loads."

MEET AN OLD FRIEND

AND GET AN EYEFUL OF ITS NEW FACE!

It's Jenkins Diamond Seal Tape in its bright new box – that makes it easy to make sure you're getting specification performance with Jenkins quality!

In meeting all ASTM and Federal Emergency specifications, Diamond Seal Friction Tape will meet your needs for a clean-handling, non-raveling tape that sticks to the job like a War Savings Stamp!

It's cellophane wrapped and sealed, too! Thus, every roll you get is as tough, tacky and fresh as the day it passed its final factory inspection.

Good supply houses carry both Diamond Seal Specification Tapes . . . Friction and Rubber . . . made by Jenkins Bros. (Rubber Div.), 80 White St., New York 13, N. Y. Also makers of famous Jenkins Gold Seal Tape.

JENKINS

Diamond Seal Specification Tape

FRICTION AND RUBBER

MADE BY JENKINS BROS. . . . MAKERS OF FAMOUS JENKINS VALVES

Scovill Tube News

Vol. 2 SCOVILL MANUFACTURING COMPANY, Waterbury 91, Conn. No. 6

New Booklet Tells How To Get Most Out Of Tubes

Scovill's "Condenser Tube Booklet" has important facts for operators of condensers and heat exchangers

Here are 56 pages of useful information on many of the important factors relating to condenser and heat exchanger tubes. Among the subjects covered are:

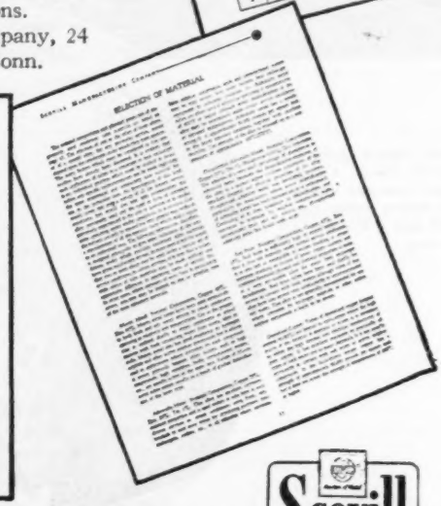
- Tube Corrosion: types (with characteristic specimens illustrated in natural color), causes and methods of protection
- Selection of Tube Material
- Composition and Properties of Tube Alloys and Common Metals
- Installation Methods
- Specifications
- Methods of Production

Also included are discussions of the extrusion process and the hot piercing process, and such useful data tables as those on gauge sizes, conversion factors, formulas and physical constants, etc.

THIS BOOKLET ILLUSTRATES 1 OF 3 SCOVILL SERVICES

Scovill considers that its responsibility to power plant operators, embraces not only tube *manufacturing*, but also *information* and *service*. Information such as is found in the new "Condenser Tube Booklet" is part of Scovill's *Service in Manuals*. A second service is *Service in Metals*, which includes the development of new or improved tube alloys and the analysis of problems arising from tubes in service. The third Scovill service, *Service in Men*, makes Scovill's technical experience available through individual recommendations for specific requirements — helping you obtain maximum efficiency from your condenser or heat exchanger tube installations.

Scovill Manufacturing Company, 24 Mill Street, Waterbury 91, Conn.



THIS IS NUMBER TWELVE in a Series of Scovill Advertisements to help you get longer life from condenser and heat exchanger tubes.

Scovill
MANUFACTURING COMPANY
WATERBURY, CONN.

SCOVILL CONDENSER TUBES

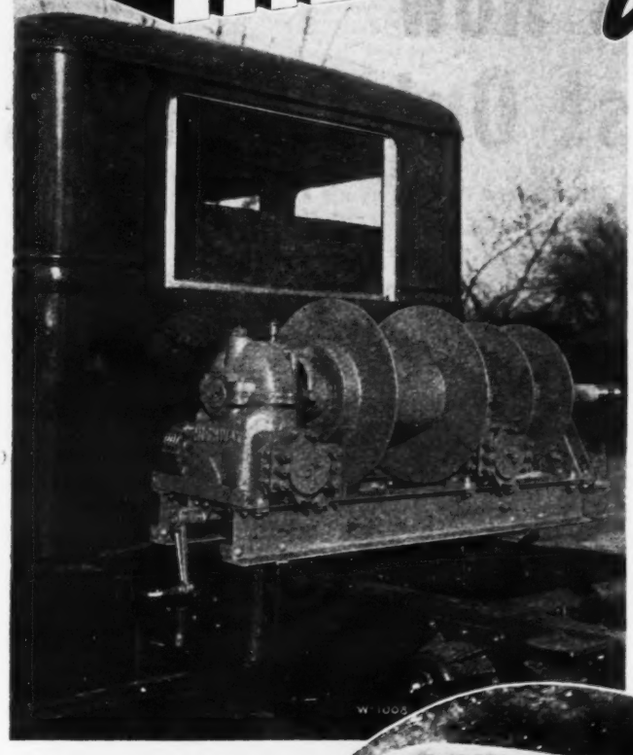
ONE PRODUCT... THREE SERVICES

Service in Manuals... Service in Metals... Service in Men

MODELS OF EFFICIENCY....

HIGHWAY *Winches*

AND POWER TAKE-OFFS



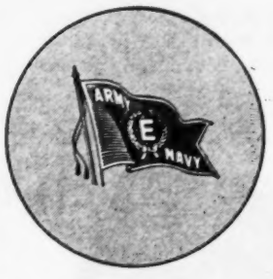
• For years HIGHWAY WINCHES in numerous models have been inducted into utility service and for years these Winches have served with characteristic HIGHWAY efficiency.

Now, with the post war period in the offing, these models of efficiency are brought to your attention so that you will be reminded of Winch equipment designed to fit into the most extensive construction work.

Smooth operation assured under heavy duty—lightweight and simplicity combined with ruggedness and safety . . . these are the factors that will contribute to your post war efficiency and economy.

ABOVE

HIGHWAY Model L-12c-6 Double Drum Winch. A dual purpose unit provided with a 12" drum having spline type clutch and with a 6" drum of the fixed type.



LEFT

HIGHWAY Single Drum Winch. A small compact file drum type especially designed for installation on 1½ and 2 ton truck chassis.

HIGHWAY TRAILER COMPANY

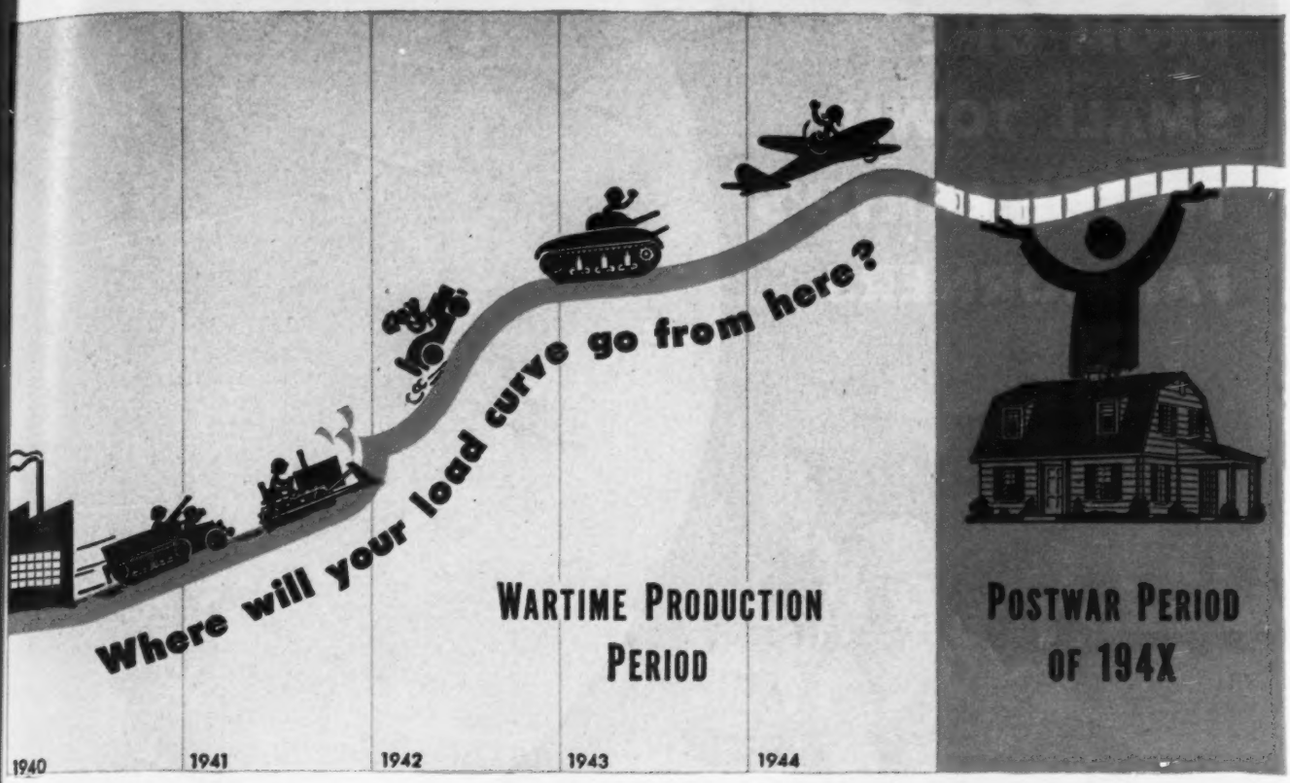
MANUFACTURERS OF

TRUCK TRAILERS AND BODIES • EARTH BORING MACHINES • WINCHES • OTHER PUBLIC UTILITY EQUIPMENT

General Offices

EDGERTON, WIS., U. S. A.

★ BETTER WIRING FOR BETTER LIVING ★



HOW rapidly utility loads return to present high levels, when the war is over, will depend to a large measure on how successfully utilities increase *peace-time residential loads*.

All signs point to a tremendous expansion in the use of electricity in the homes of 194X. These highly desirable and profitable domestic loads cannot be achieved to the maximum until the public is educated to demand "*better wiring for better living.*"

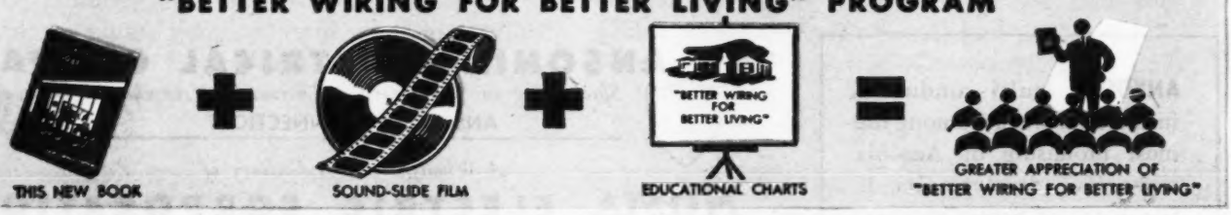
The Westinghouse Better Homes Department has embarked on a new program to help you break your bottle-neck in domestic loads—caused by *inadequate* home wiring.

This load building program is built around the new book..."Electrical Living in 194X"... designed for the building profession and allied interests, *including utilities*. It will help you explain to home owners the urgent need for proper wiring—correct lighting and lighting controls—modern circuit protection, etc.

Further—to promote this program, we have prepared a *sound-slide film* and *chart* especially for utilities. Your representatives can use this material in selling the need of "wiring ahead" . . . to local architects, engineers, builders, contractors, wiremen and other factors in the building industry.

For complete information regarding the "Better Wiring for Better Living" Program, communicate with your Westinghouse District Office or write: Better Homes Department (EW-124), Westinghouse Electric & Manufacturing Company, Pittsburgh 30, Pennsylvania.

"BETTER WIRING FOR BETTER LIVING" PROGRAM



THIS NEW BOOK + SOUND-SLIDE FILM + EDUCATIONAL CHARTS = GREATER APPRECIATION OF "BETTER WIRING FOR BETTER LIVING"

Westinghouse

Plants in 25 Cities Offices Everywhere

TUNE IN: John Charles Thomas, Sunday 2:30, EWT, NBC. Ted Malone, Monday, Wednesday, Friday 10:15 pm, EWT, Blue Network

FROM ONE SMALL TOWN TO THE EARTH'S FAR CORNERS

OUT to the Far East, to ports on the seven seas identified only in code on the packing cases, goes war material so vital that it is needed on every beachhead and before the beachhead is created—poured out of *one* shipping room in just *one* factory in just *one* small Connecticut town!

Incredible? Not when Yankee ingenuity is taken into consideration—the same Yankee ingenuity that stems from many lifetimes of meeting difficult situations.

That's the case here at Ansonia—typical of our approach to the problems which any form of electrical cables can solve. However difficult the requirements of peace may be, we feel that we can be of assistance in meeting them in new ways, as we have met the changing problems of war *and peace* before.

ANKOSEAL multi-conductor insulated cables are among the most promising of Ansonia war-proven developments. If you have, or expect to have, a use for electrical cables—

CHECK ANKOSEAL!

THE ANSONIA ELECTRICAL COMPANY

Specializing in "Ankoseal" a Thermoplastic Insulation

ANSONIA • CONNECTICUT

A Wholly-Owned Subsidiary of

NOMA ELECTRIC CORPORATION

GENERAL OFFICES • NEW YORK, N. Y.

—In peacetime makers of the famous Noma Lights—the greatest name in decorative lighting. Now, manufacturers of fixed mica dielectric capacitors and other radio, radar and electronic equipment.

Both
PERSONNEL
and
WIRING SYSTEM
are
PROTECTED

SAFETY is a prime factor in the construction of Type AC THERMAG CIRCUIT BREAKER PANELBOARDS

All current-carrying parts are permanently covered —careless hands can't touch them . . . Needless circuit interruptions are prevented when harmless, momentary overloads occur—but the circuit breakers "trip" on short circuit or harmful, sustained overload . . . These circuit breakers are operated like an ordinary tumbler switch. Simply return the handle to the ON position when the cause of the short circuit or overload has been removed.

They afford modern protection with ease of operation, and are built for long life — these circuit breakers are Underwriters' Laboratories tested *for ten thousand complete operations.*

The cabinets are designed with ample gutter space and plenty of knockouts to expedite installation. Ⓕ Pressure Type (Solderless) Connectors on mains facilitate connection.

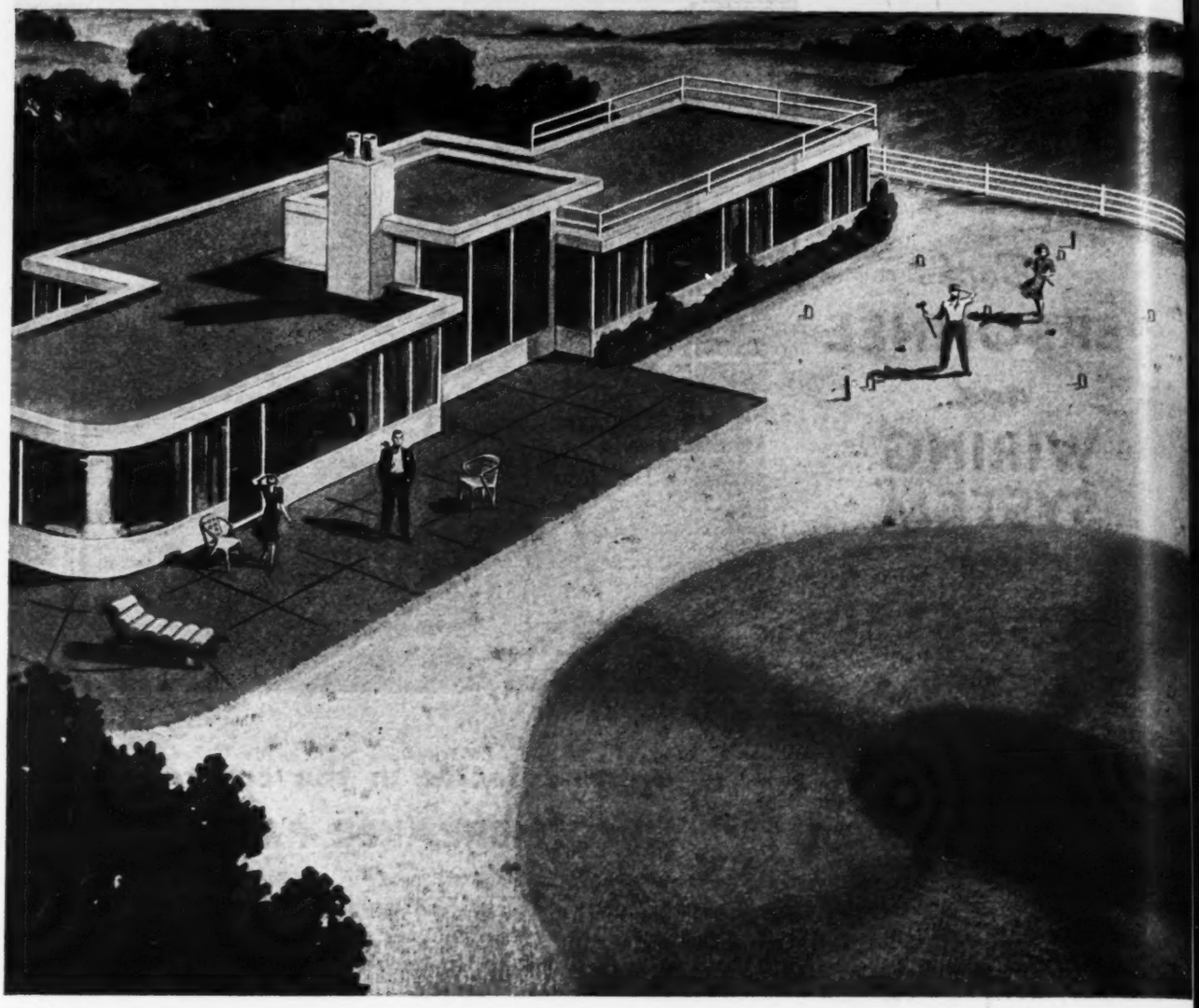
Ⓕ Type AC Thermag Circuit Breakers are assembled in Panelboards of 4 to 42 branches, for light and appliance service, in standard, narrow column type, and dust-tight cabinets — for either surface or flush mounting. Branch circuit capacities: 15 to 50 amperes, 120 volts AC, for 3 wire single phase or 4 wire three phase mains . . . Mass production of Ⓕ Panelboards is attained by the use of standardized units as component parts. This results in equipment of high efficiency at lowered cost.

Write for Bulletin 67

It contains complete descriptions, dimensions, capacities, wiring diagrams, prices and suggested specifications. You'll find it helpful . . . Frank Adam Electric Company, Box 357, St. Louis 3, Mo.

Frank Adam
ELECTRIC COMPANY
ST. LOUIS

★ NUMBER 14 IN A SERIES OF MESSAGES BY KELLETT AIRCRAFT CORPORATION



"SIGN IN THE SKY..."

See that shadow! It is symbolic of a new and different type of aircraft. Rapid progress has been made in helicopter development during the war, under Government sponsorship . . . and the modern helicopter can be expected to play a practical and useful part in the great future of air transportation.

The special flying abilities of the helicopter qualify it for many time-saving peacetime applications . . . augmenting conventional air transport . . . serving and saving in uses beyond present limitations.

So look ahead and look aloft. While all present Kellett facilities are concentrated on military production, the Kellett engineering staff and productive organization are working toward the day when "flying without wings" will take its useful place in tomorrow's skies.

SEND FOR INTERESTING BOOKLET

There may be some questions in your mind about the helicopter . . . its capabilities, possibilities, and its probable post-war services. If so, send for an interesting booklet, "Answering Some Helicopter Questions." Write Kellett Aircraft Corporation, **Dept. E** Upper Darby (Philadelphia), Pa.

KELLETT

OLDEST ROTARY WING AIRCRAFT MANUFACTURING COMPANY

Alcoa Aluminum is Available

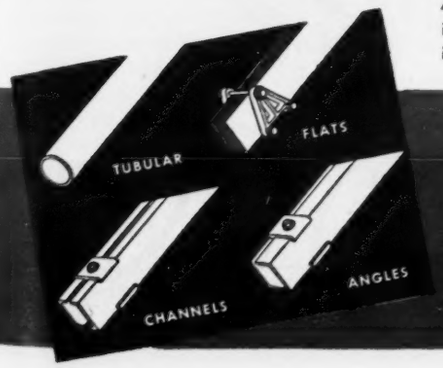
FOR BUS BARS AND FITTINGS

Now that the supply of aluminum exceeds the demands for military uses, Alcoa Aluminum bus bar shapes and fittings are again available. You can proceed with the extension and modernization work held up by previous restrictions.

Less labor is required to install aluminum bus bars. Their lighter weight makes handling and erection easier. Supports can be similarly lighter and more widely spaced. Buses can, therefore, often be installed without expensive reinforcement of structures.

Alcoa engineers will gladly help select conductors and fittings for your bus installations. Write ALUMINUM COMPANY OF AMERICA, 2138 Gulf Building, Pittsburgh 19, Pennsylvania.

The idea of using structural shapes for electrical conductors was originated by Aluminum Company of America; better ventilation and higher efficiency, rigidity and strength of a girder. This first installation of channel bus bars, installed in 1928, has a run of 1,600'. Conductors are 5" Alcoa Aluminum channels.



ALCOA
ALUMINUM

THESE *Crestoloy Pliers* WILL BE BACK IN HOMEFRONT SERVICE

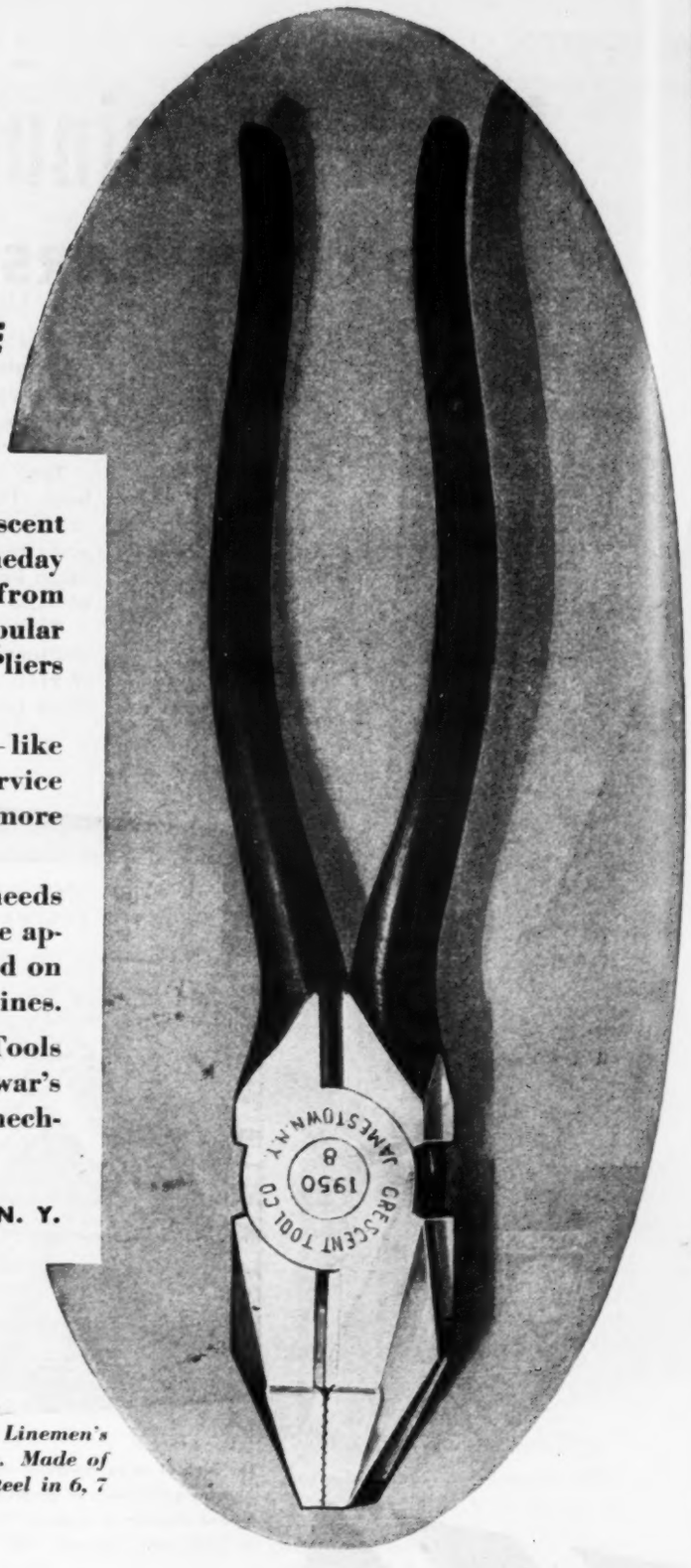
Here is another Crescent Tool product that someday will be coming back from "the wars." The very popular Crescent Linemen's Side Cutting Pliers made of forged Crestoloy steel.

We do not hesitate to admit that — like other Crescent Tools — military service has made them better, stronger and more serviceable in use.

This tool was designed to meet the needs and rugged use to which it must be applied. Each one is *individually* tested on our specially designed testing machines.

As long as the war lasts, Crescent Tools will be "few and far between." With war's end, they will be available to good mechanics everywhere.

CRESCENT TOOL CO., JAMESTOWN, N. Y.



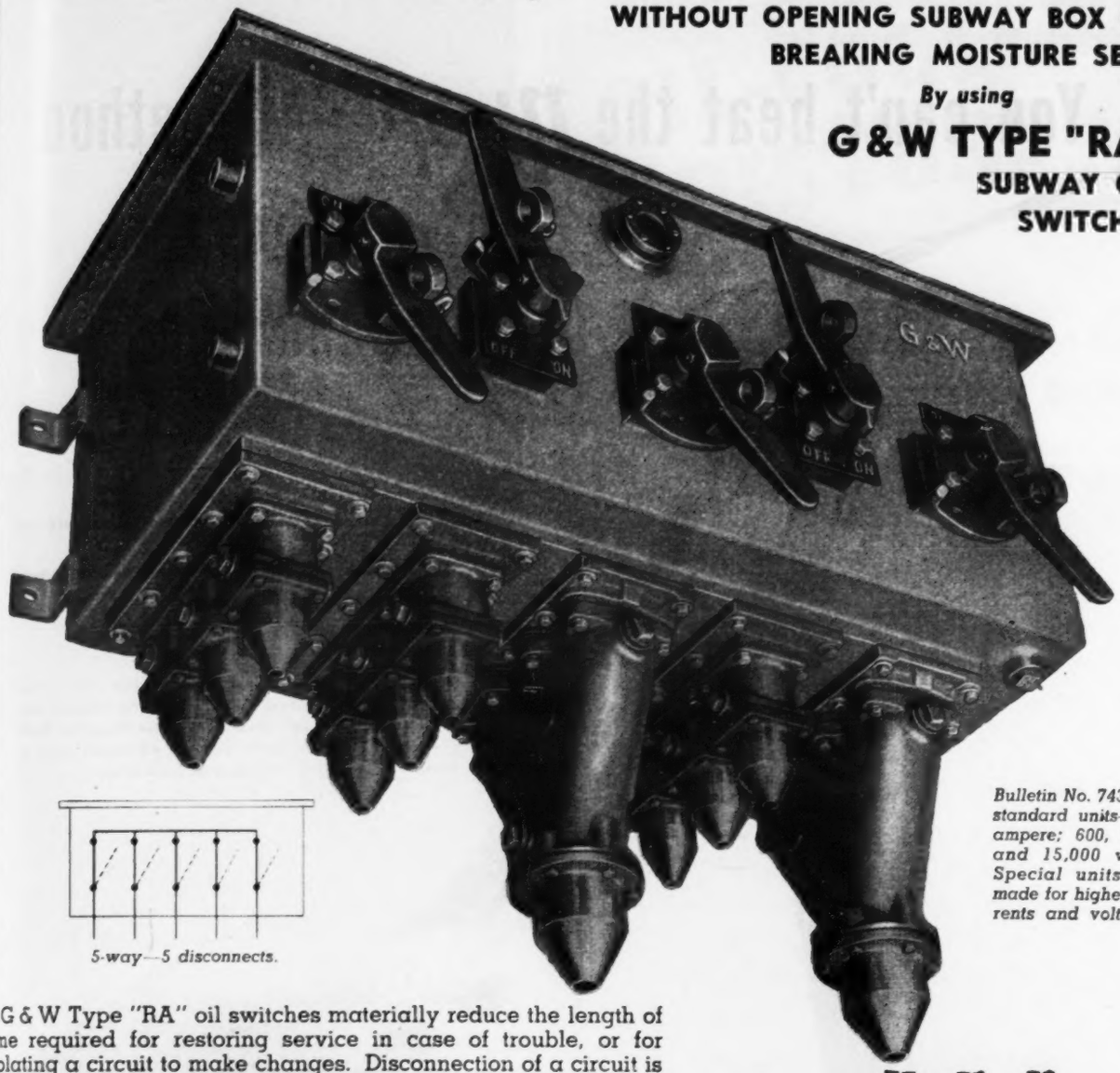
Crescent No. 1950, Linemen's Side Cutting Pliers. Made of forged Crestoloy Steel in 6, 7 and 8" sizes.

Disconnect underground cable circuits

WITHOUT OPENING SUBWAY BOX OR BREAKING MOISTURE SEAL

By using

G&W TYPE "RA" SUBWAY OIL SWITCHES



5-way—5 disconnects.

Bulletin No. 743 lists standard units—400 ampere; 600, 7,500 and 15,000 volts. Special units are made for higher currents and voltages.

G & W Type "RA" oil switches materially reduce the length of time required for restoring service in case of trouble, or for isolating a circuit to make changes. Disconnection of a circuit is accomplished by merely operating an external handle—*without opening the tank or breaking the seal.*

Sectionalizing devices should be safe and reliable — they should be simple in design and construction — they should be proved by several years experience under various conditions of installation. They should not fail to function properly even though they may not be operated over long periods of time. G & W Type "RA" oil switches and multiple circuit subway oil disconnects meet these requirements. Originated in 1928, they have an excellent service record. They are simple and practical —ordinarily consisting of only three elements . . . rocker arm link assemblies, welded steel tanks and unit sealed cableheads. These elements can be arranged in many different forms.

Write us or our nearest representative for further data.

ROCKER ARM LINKS

Self-aligning floating contact links are encased in porcelain bushings which are in turn clamped between impregnated wood straps. The links pivot on one set of stationary contacts.

G&W ELECTRIC SPECIALTIES

Originators and pioneers of equipment for sound methods of underground and overhead electric distribution.

G&W ELECTRIC SPECIALTY CO.

7780 DANTE AVE., CHICAGO 19, ILL., U. S. A.

Also made in Canada by Powerlite Devices, Ltd., Toronto

Potheads . . . Boxes . . . Oil Fuse Cutouts . . . Oil Switches . . . Multiple Circuit Disconnects

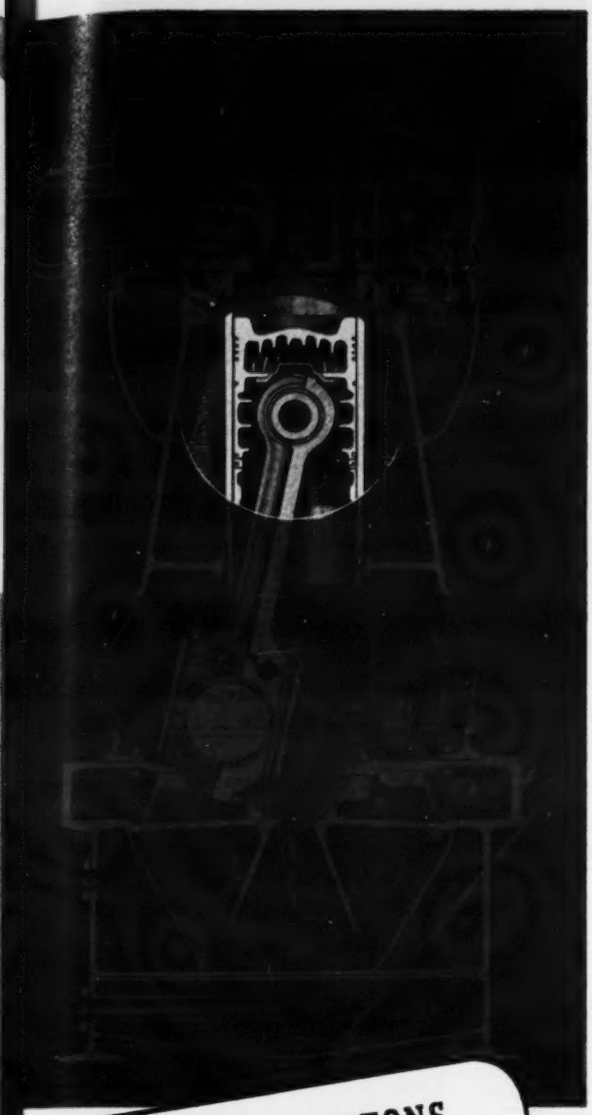
You can't beat the *Nicopress* method of making Offset Dead ends

1. They are designed for use on copper, Copperweld and Copperweld-copper conductors.
2. They can be installed on Pin, Strain or Spool insulators.
3. Simplicity and speed of installation.
4. Strength and tightness.
5. Provide for a tail of any desired length.
6. No extra tools are required to make the offset dead end as the same tool used in making regular line splices will do the job. These convenient Nicopress Tools are small and compact and are extremely easy to operate close to the insulators or cross arms.

THE NATIONAL TELEPHONE SUPPLY COMPANY

The National Telephone Supply Company

5100 SUPERIOR AVENUE • CLEVELAND 3, OHIO
Canadian Mfr.—N. SLATER CO., LTD., HAMILTON, ONT., CANADA
Export Distributor—
INTERNATIONAL STANDARD ELECTRIC CORP., NEW YORK, N.Y.



OIL-COOLED PISTONS

Another of 22 advanced features combined exclusively in Hendy Diesels

Among the many advanced design features in the Series 50 Hendy Diesels are oil-cooled pistons—to keep rings cool and free, improve top-cylinder lubrication, and minimize cylinder wear. Of clean, rugged design, Hendy pistons are cast in Hendy's own modern foundry to exacting specifications. Heavy ribbing under the piston head provides strength and aids correct cooling by providing maximum surface against which cooling oil is directed from a jet in the top of the connecting rod.

ONLY ONE OF MANY FEATURES

Oil-cooled pistons are but one of the many features combined by Hendy for the first time in a single engine. Others include overhead camshaft, dual intake and exhaust valves with hydraulic tappets, automatically lubricated valve crossheads and guides, and maximum accessibility through *large* inspection doors.

350 TO 675 HP—4 CYCLE

Whatever your requirements may be, within this power range, you will find that Hendy Diesels warrant your closest inspection—they will give you long and dependable service.

For stationary power service or combined with generators as electric power units Hendy Diesels offer a reliable, economic source of power.

A NEW CATALOG which shows many other features of the Hendy Diesel is now available. Please state your power needs and operating conditions if requesting quotations.

OIL-COOLED PISTONS INCREASE DEPENDABILITY

Correct piston temperatures are assured in the Hendy engine by means of the heavy ribbing on the underside of the pistons and by direction of a continuous stream of cool oil against the ribs. By controlling the temperature of the pistons—and their rings—a superior oil film is maintained on the cylinder walls. This has many advantages: Reduced ring wear...reduced cylinder wear...low oil consumption...freedom from stuck rings...higher operating efficiency...lowered maintenance costs. All of these factors save money for Hendy owners—and are typical of the advanced design features of these engines.

JOSHUA HENDY IRON WORKS
ESTABLISHED 1856
SUNNYVALE, CALIFORNIA

54-D-9

Branch Offices: BOSTON · BUFFALO · CHICAGO · CINCINNATI · CLEVELAND · DETROIT · HOUSTON · LOS ANGELES · NEW YORK · PHILADELPHIA · PITTSBURGH · SAN FRANCISCO · ST. LOUIS · WASHINGTON

QUALITY

A REWARD OF VICTORY

The high pre-war reputation of LINOLITE fluorescent fixtures was won on the strength of quality.

Frink never built to a price. Rather, Frink engineered its products to fulfill exacting lighting needs with the utmost efficiency. As a result, LINOLITE became recognized as "the ultimate in fluorescent lighting" by architects, builders, electrical contractors.

With the coming of war, Frink's engineering and fabricating skills were diverted 100% to making vital parts for America's fighting machines. Thus, our reputation for precision work was carried on, but the production of LINOLITE necessarily ceased for the duration.

The time now approaches when quality can again be demanded in lighting and many other lines. The need for accepting substitutes grows less as Victory comes nearer. Soon you can again trust Frink for new, better-than-ever fluorescent fixtures . . . engineered for the advanced lighting of the post-war era.

FRINK

L-I-N-O-L-I-T-E

THE ULTIMATE IN FLUORESCENT LIGHTING

THE FRINK CORPORATION, Bridge Plaza North, Long Island City 1, N. Y.

Subsidiaries: Sterling Bronze Company, Inc. • Barkon-Frink Tube Lighting Corporation

LIGHTING SINCE 1857

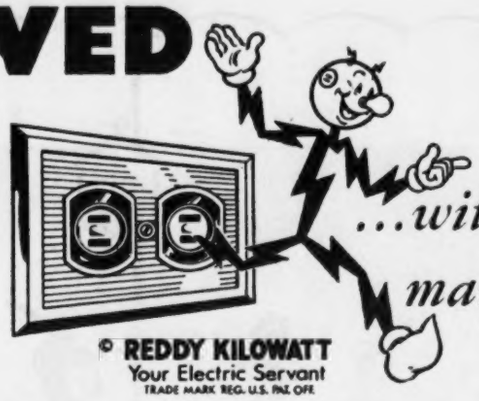
SPANG-CHALFANT

Division of The National Supply Company

Executive Offices: Grant Building, Pittsburgh, Pa.

District Offices and Sales Representatives in Principal Cities

"IMPROVED SERVICE ...with thousands of man-hours saved"



© REDDY KILOWATT
Your Electric Servant
TRADE MARK REG. U.S. PAT. OFF.

KARDEX *Customer History and Service Location Records at*
SAVANNAH ELECTRIC & POWER CO.

THE double advantage of better record control and substantially lowered operating costs were the Savannah Electric & Power Company's chief reasons for replacing their old methods with Kardex *Visible* Record Control.

Thousands of man-hours have been saved by this utility in the midst of an acute manpower shortage. The centralized Kardex records eliminate much paper work and reference to multiple records, and also simplify "new" employee training.

SERVICE ORDERS of vastly increased quantity are handled with speed and efficiency. The Kardex Meter and Transformer History Records facilitate greater equipment utilization.

COLLECTION POLICIES, based on instantly visible individual history records, are kept on a *currently* selective basis—a vitally important safeguard under war and post-war conditions.

PUBLIC RELATIONS are improved too...Although much heavier than normal, customer service activities proceed smoothly and efficiently with Kardex providing all wanted data without delay.

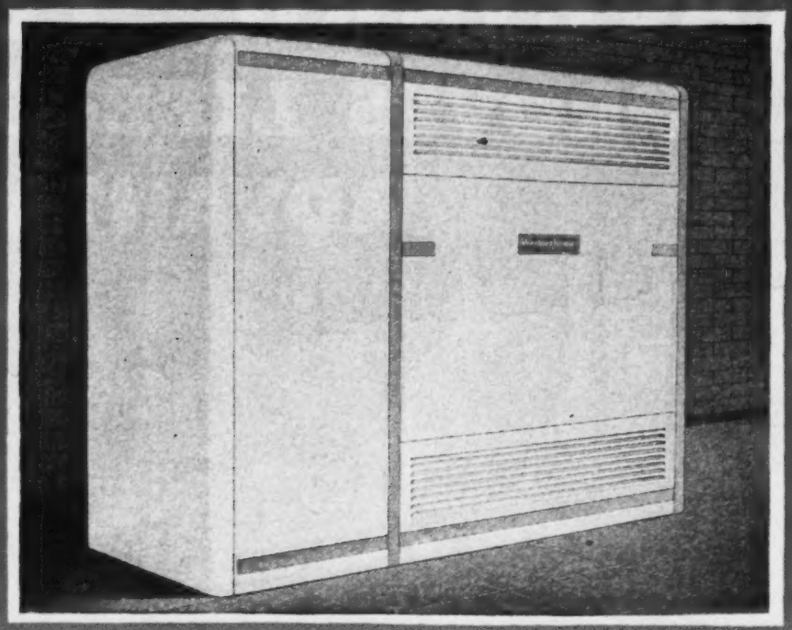
As officials of this Company say, "Once we knew every customer and could decide each case without reference to records, but now we must and gladly *do* let Kardex furnish the facts. We've obtained better control and we save thousands of man-hours."

FULL DETAILS showing how Kardex is enabling large and small public utilities to obtain greater efficiency with reduced costs are available from any Remington Rand Branch Office.

COPYRIGHT 1944

SYSTEMS DIVISION
REMINGTON RAND
Buffalo 5, New York

Reddy Kilowatt used by courtesy of Ashton B. Collins



Westinghouse ASL Transformers are available in 150 to 4,000 kva ratings, 15,000 volts and below

1,000,000 kva says OK!

THE ASL TRANSFORMER COMBINES:

1. **GREATER SAFETY**—No cooling liquids—no fire or explosion hazards. No vault is required.

2. **GREATER RELIABILITY**—Winding temperature is not a critical factor in loading . . . heavy overloads carried safely.

3. **LOWER INSTALLATION COST**—Transformers can be placed indoors near load centers—no long secondary runs of heavy copper—no catch basins or drains are required. Lighter weight and easier to handle in the larger ratings.

4. **LOWER MAINTENANCE COST**—No periodic liquid reconditioning—no gasketed joints to maintain, no valves to leak. Maintenance is negligible, even in dust-laden atmospheres.

5. **GREATER SPACE ECONOMY**—In large ratings ⅓ or more of the space that is required by liquid-filled transformers may be saved.

6. **LOWER COMBINED COST**—In major substation design, both air-cooled transformer and metal-clad switchgear with air breakers can be installed **INDOORS** as a completely metal-enclosed, multiple unit substation . . . saving cable cost, space and installation work.

Dust . . . dirt . . . fumes . . . heat . . . dampness . . . condensation . . . none of these enemies of electrical equipment found in metal-working shops, coal mines or paper mills, in both temperate and tropical zones, have been able to affect the operation of Westinghouse Type ASL Air-Cooled Transformers.

Since their introduction in 1936, Type ASL Transformers have received extensive field testing—particularly by emergency war loads which have compressed decades of normal operation within a few years. Over 2,000 installations, totaling more than 1,000,000 kva, are proof today that the ASL Air-Cooled Transformer is the one right answer for indoor industrial plant distribution systems.

For complete information call your Westinghouse Office, or write Westinghouse Electric & Manufacturing Company, Box 868, Pittsburgh 30, Pa.

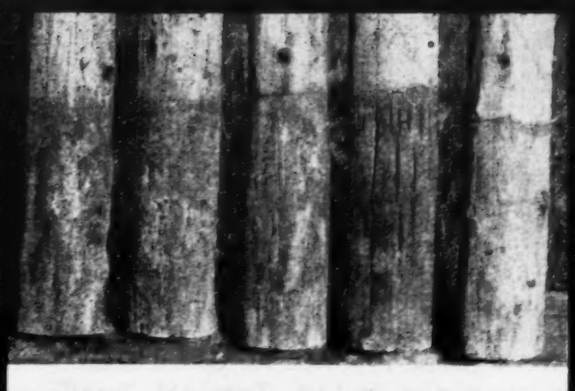
J-70434

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Packaged Power

"GRAVEYARD" TEST PROVES LIFE-SPAN ADVANTAGES



Above: Untreated pole test sections, placed in decay-favoring test plot in 1942, pictured October 13, 1944. Note badly deteriorated condition of each pole at and below the groundline.

Below: Pole sections, treated with pentachlorophenol solution. Placed in testing ground fall of 1940, pictured October 13, 1944. No evidence of fungus infection or decay.

Exceptional Decay Conditions Show Life-Span Pole Sections Sound and Free from Attack

To test the effectiveness of the pentachlorophenol used in the LIFE-SPAN treatment, Cedar Pole tops have been set in test plots soil with surrounding vegetation abnormally conducive to the propagation and growth of fungi with resulting wood rot.

Examination October 4, 1944 shows:—*Untreated* pole test sections were severely attacked by fungus growth after two years exposure. *Pentachlorophenol treated* pole test sections set two years earlier were in sound condition with no evidence of infection or decay. Note the marked contrast in the unretouched photographs at the left.

Life Span

Sold only by the following:

B. J. CARNEY & CO.
Spokane Minneapolis

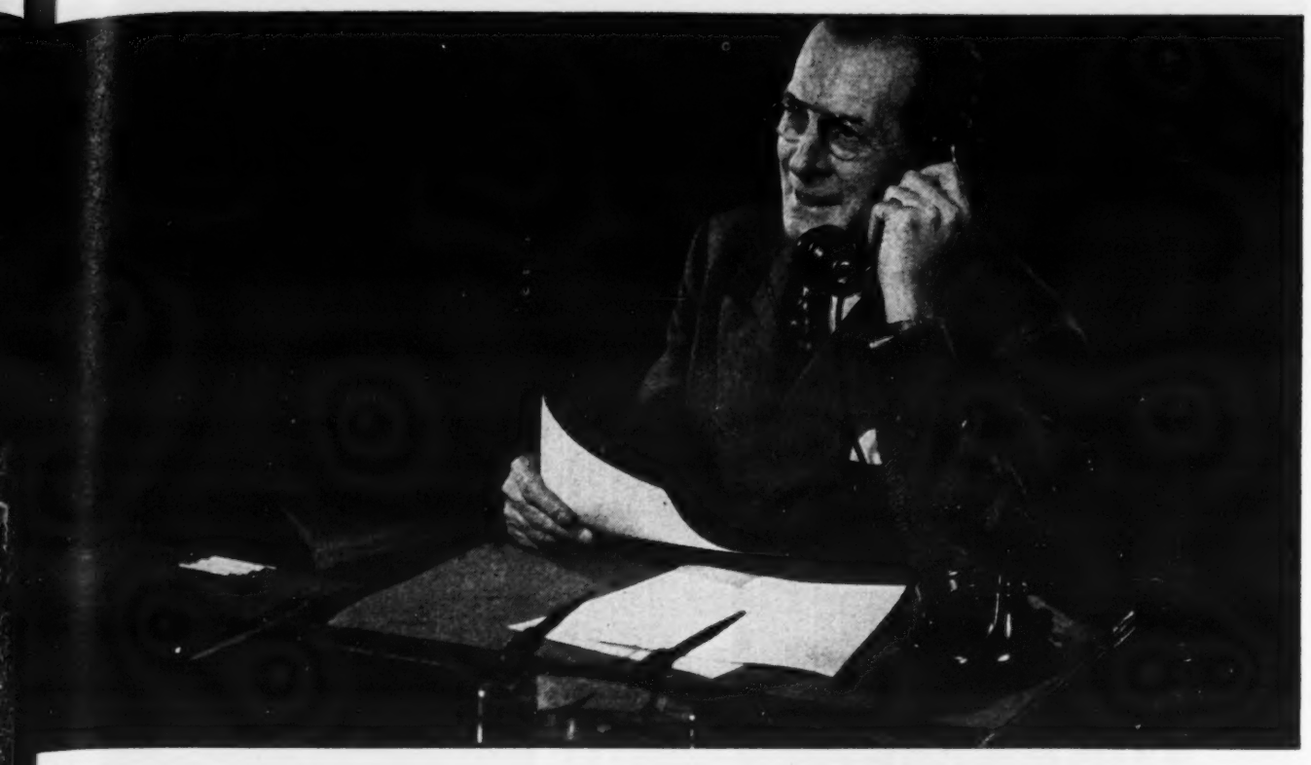
SCHAEFER-HITCHCOCK
Sandpoint, Idaho
Suppliers for Joslyn

NAUGLE POLE & TIE CORP.
Minneapolis, Minn.

PAGE AND HILL CO.
Minneapolis, Minn.
50 Church St., New York, N. Y.

CONSOLIDATED TREATING CO.

MINNEAPOLIS MINNESOTA



Sure, there's a solution to "Load Drop"!

A SOLUTION for which you should begin preparations today. To lay the foundation for continued "war-par" electric power consumption in new fields, check your commercial customers for electric cooking.

Make surveys of your commercial cooking and baking customers and do a pre-selling job for electric cooking. These prospects are now using out-moded equipment and will be only too happy to cook the *modern electric way* as soon as equipment is available.

Hotpoint-Edison is Pre-Selling for You

Advertising in business magazines is giving impetus to post-war electric cooking. Hotels, restaurants, bakeries, schools, hospitals and other institutions are being told the story of electric cooking . . . pre-selling customers for you and for Hotpoint-Edison.

With the aid of this advertising, you are able to point out to prospects the economy, convenience and efficiency of electric cooking. They now are using electricity for lighting, motors, refrigeration and ventilation . . . the same cooking fuel will be a money-saver for them (reduced rates) and help eliminate "load drop" for you. With electric cooking they will enjoy also, a cooler, better ventilated and more compact kitchen.

Some Equipment Now Available

Some prospects are now eligible to buy new electric equipment since government regulations permit manufacture of a limited quantity of essential civilian goods. Those whose present equipment is inadequate or beyond repair are eligible. Have them consult their local Hotpoint-Edison dealer or write to us.

Edison General Electric Appliance Company, Inc.
5618 West Taylor Street, Chicago 44, Illinois

For outstanding achievement in War Production

FOUND ONLY IN MODERN KITCHENS

Hotpoint Edison

COMMERCIAL ELECTRIC COOKING EQUIPMENT

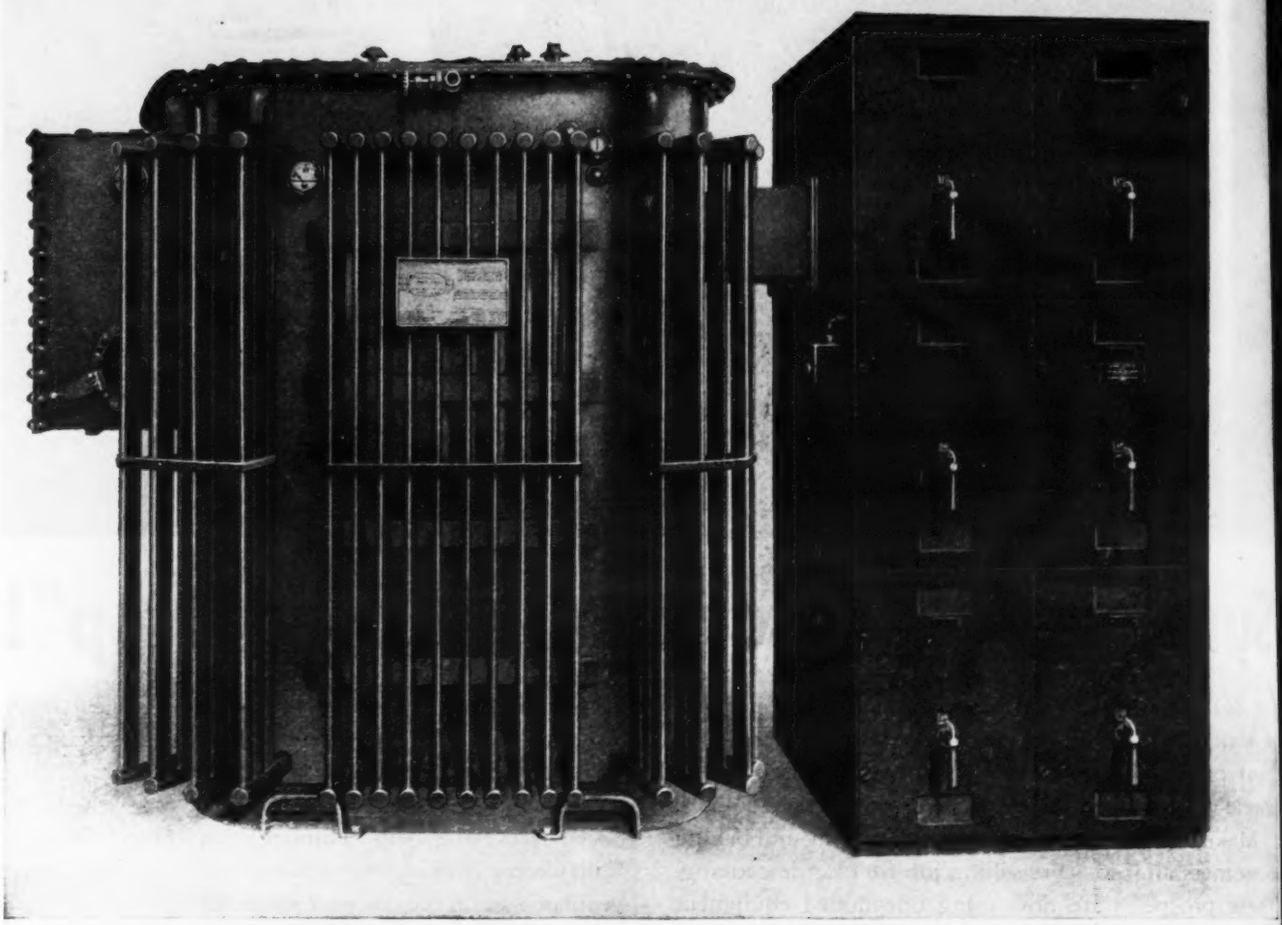
RANGES • BAKE OVENS • ROASTING OVENS
DEEP FAT FRY KETTLES • BROILERS • GRIDDLES

OLDEST AND LARGEST MANUFACTURERS OF ELECTRIC COOKING EQUIPMENT

FOR VICTORY — BUY U. S. WAR BONDS AND STAMPS

MOLONEY

UNIT SUBSTATIONS
WITH ASKAREL, AIR, OR OIL-COOLED
TRANSFORMERS



MOLONEY Load Center Type UNIT SUBSTATIONS

ILLUSTRATED is a 1000 Kva Moloney Unit Substation used in an industrial plant for load center power distribution. Transformer is Askarel-cooled permitting installation indoors without the expense of a fireproof vault. Locating substation at center of load eliminates long runs of expensive secondary copper. Better regulation increases voltage at points of use, improving performance of equipment served. Unit construction incorporating primary switch, transformer and secondary air circuit breakers simplifies installation and operation.

Load Center type Unit Substations such as this are available with Air-cooled or Askarel-cooled transformers for indoor installation, and Oil-cooled or Askarel-cooled transformers with weatherproof switchgear construction for outdoor use. Unit Substations can be supplied with primary air circuit breakers, selector switches, load break switches, power fuses, metering equipment, or any other desired features.

MOLONEY ELECTRIC COMPANY • ST. LOUIS, U. S. A.

SALES OFFICES

Alexandria, Va.....401 Doniphan Bldg.
Atlanta, Ga.....217 Whitehall St., S. W.
Birmingham, Ala.....1814 First Avenue, North
Bluefield, W. Va.....201 Union Street
Boston, Mass.....Statler Office Bldg.
Charlotte, N. C.....124 Brevard Court
Chicago, Ill.....100 West Monroe Street
Dallas, Tex.....709 Thomas Bldg.
Denver, Colo.....612 Insurance Bldg.
Detroit, Mich.....{16125 Grand River Drive / 744 New Center Bldg.
Grand Rapids, Mich.....412 Houseman Bldg.
Houston, Texas.....4411 Navigation Blvd.
Indianapolis, Ind.....909 Roosevelt Bldg.
Kansas City, Mo.....624 Dwight Bldg.
Knoxville, Tenn.....Harrill Hills
Los Angeles, Calif.....124 W. 4th St.
Minneapolis, Minn.....643 Midland Bank Bldg.
New Orleans, La.....428 Balter Bldg.
New York, N. Y.....55 Liberty Street
Omaha, Nebr.....503 Sunderland Bldg.
Pittsburgh, Pa.....837 Oliver Bldg.
Portland, Ore.....1233 N. W. 12th Avenue
St. Louis, Mo.....5390 Bircher Boulevard
Salt Lake City, Utah.....314 Kearns Bldg.
San Francisco, Calif.....420 Rialto Bldg.
Seattle, Wash.....532 First Avenue, South
Shreveport, La.....630 Spring Avenue

10 of the best lighted communities in America
When every hour is H-hour
stop this !
AVAILABLE NOW!
A POWERFUL CAMPAIGN
TO HELP YOU BUILD GOOD WILL
WHO'S TO BLAME
Can your town afford to pay this bill?
The Case of the People
vs.
Poorly Lighted Streets

REPRODUCED on this page is a series of six attractive and compelling direct mail folders . . . prepared for your use in promoting adequate street lighting.

Designed by men who specialize in influencing public opinion, this campaign will awaken municipal officials to the pressing need for better lighted, safer streets to meet postwar traffic and business conditions . . . pave the way for your street lighting salesmen.

Each piece carries a complete sales story on adequate street lighting, yet each ties in with the others to make a unified and effective campaign.

Reproduced in several colors in varying sizes and shapes to assure variety and interest. Filled with before-and-after photographs, examples of what other towns have accomplished, statistics which prove the many benefits of adequate street lighting, and strong urges to act.

Ready now for imprinting and mailing at 45 cents per set of six (10% off on orders of 100 sets or more). Take advantage of this opportunity to build good will and postwar business. Write today for free samples and information on additional street lighting sales aids prepared for you by The Street Lighting Section of NEMA, 155 E. 44th Street, New York 17, New York.

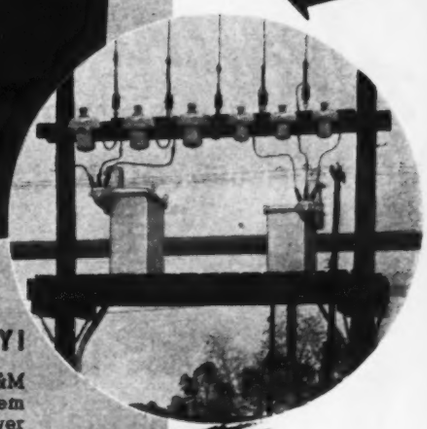
Good Street Lighting Builds Good Will

EC&M Builds 2300 Volt Motor Starters IN UNIT-FORM

FOR SAFETY . . .

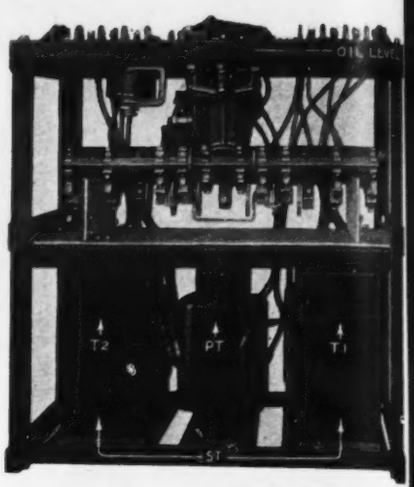
FOR CONVENIENCE IN INSTALLATION . . .

FOR LONG LIFE . . .



THEY COULDN'T RISK A DELAY!

Prominent oil refinery selected EC&M 2300 volt Starters and mounted them out-of-doors on platform between power poles.



Note clean-cut design of this reduced voltage starter mechanism for 2300 volt motors.

CLEAN-CUT DESIGN

1. Single, quick-break, double-throw contactor operated by a single magnet.
2. Two liberally-rated auto-transformers marked T_1 and T_2.
3. Potential transformer (marked PT) for 220 volt push button circuit.
4. Current limit relay trips mechanical latch to transfer from reduced to full voltage.
5. Variable reactor on top of mechanism permits quick change of transition-setting, when desired.
6. Continuous torque acceleration.
7. High torque efficiency in starting.
8. Adjustable, magnetic type overload relays, arranged for magnetic reset from push button.

● In many plants, managements have come to know that EC&M Unit Starters are a valuable ally for their 2300 volt motor starting requirements. Complete enclosure of all high voltage parts not only provides a *shock-proof* installation but reduces time and material in installation. With the mechanism totally oil-immersed, operating parts are always lubricated and also protected from corrosion. Push button operation brings the motor up to speed with greater skill than human hands could do it. What could be safer—more reliable!

Ask for Bulletin 1047-C

THE ELECTRIC CONTROLLER & MFG. CO.

2698 E. 79th ST. ★ CLEVELAND 4, OHIO

JUST PUSH A BUTTON . . . AND SCHRAMM COMPRESSORS GIVE A STEADY FLOW OF AIR!

Yes — easily and quickly — a few minutes after you put Schramm Air Compressors on the job . . . you get a steady flow of air *at the pressure you want it!*

Utilities use Schramm—not only for general field service—but in the steam plants, generating stations, repair shops.

Schramm Compressors are compact, light-weight, and available in any truck or trailer-type mounting.

Check these under-the-hood features:

1 *Completely watercooled to provide ideal performance in winter as well as summer.*
2 *Main Bearings for every cylinder.*
3 *Mechanical Intake Valve.*
4 *More Cylinders and lighter parts.*
5 *Forced feed lubrication.*

Details of Schramm Compressors, and the advantages they offer, are contained in a new, fully illustrated booklet—yours for the asking. *Write today for your free copy of Bulletin PUB-44.*

SCHRAMM INC.

THE COMPRESSOR PEOPLE
WEST CHESTER
PENNSYLVANIA

BACKING THE

BUY MORE WAR BONDS!

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

BABCOCK &

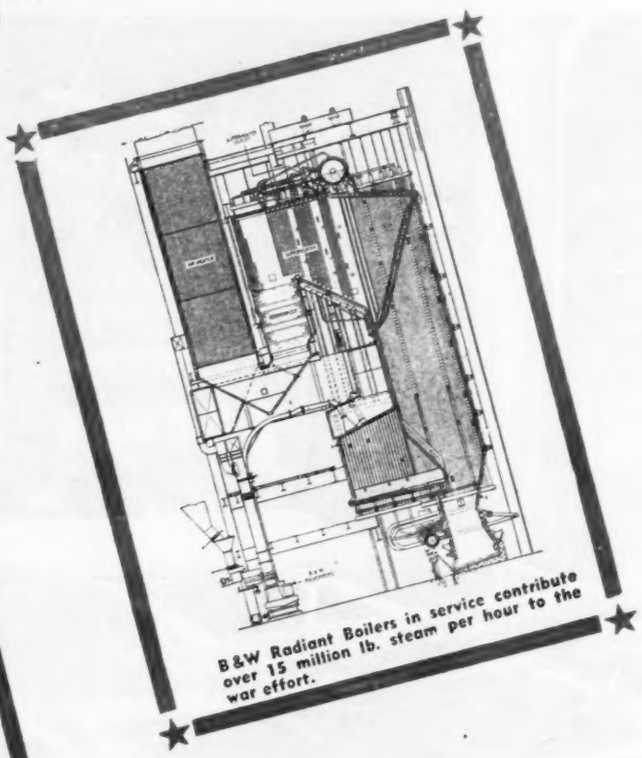
ATTACK...with POWER

What's back of the smashing offensive that is carrying the war to the Axis? The dynamic energy of management and labor . . . the amazing ingenuity of engineers . . . and, not least, the gigantic load shouldered by our public utilities and industrial power plants.

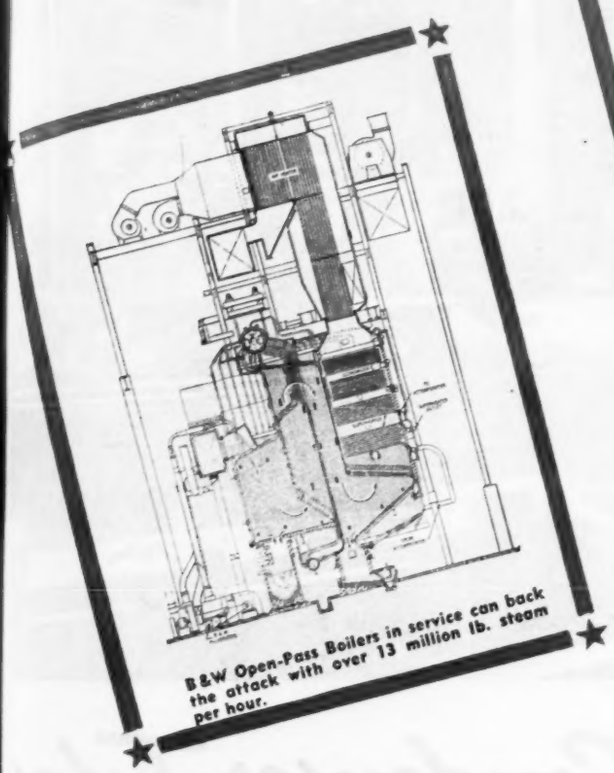
It would be impossible to over-emphasize the importance of power to the almost incredible production of ships, planes, tanks, guns, ammunition, and other war material. In producing steam to supply electrical energy, American power plants are keeping war-plant machines humming at stepped-up speeds never before attained. As J. A. Krug of WPB aptly sums it up, "Power has never been too little or too late."

Working with power plant executives and personnel has been a privilege for Babcock & Wilcox . . . and an opportunity to apply our experience in steam generation to the war-vital needs of expanding and maintaining boiler capacity.

We at B&W know that when the history of this war is written, the electric light and power industries will receive high recognition for a job well done . . . even wider recognition than the special citation already conferred upon them "for distinguished wartime achievement."



B&W Radiant Boilers in service contribute over 15 million lb. steam per hour to the war effort.



B&W Open-Pass Boilers in service can back the attack with over 13 million lb. steam per hour.

The Babcock & Wilcox Company

85 Liberty Street, New York 6, N. Y.

& WILCOX ★★★★★★★★★★

G-274T

Performance in service depends on control in manufacture

TECHNICAL RESEARCH, scientific production controls and the most searching inspection procedures insure the quality of Anaconda Condenser Tubes.

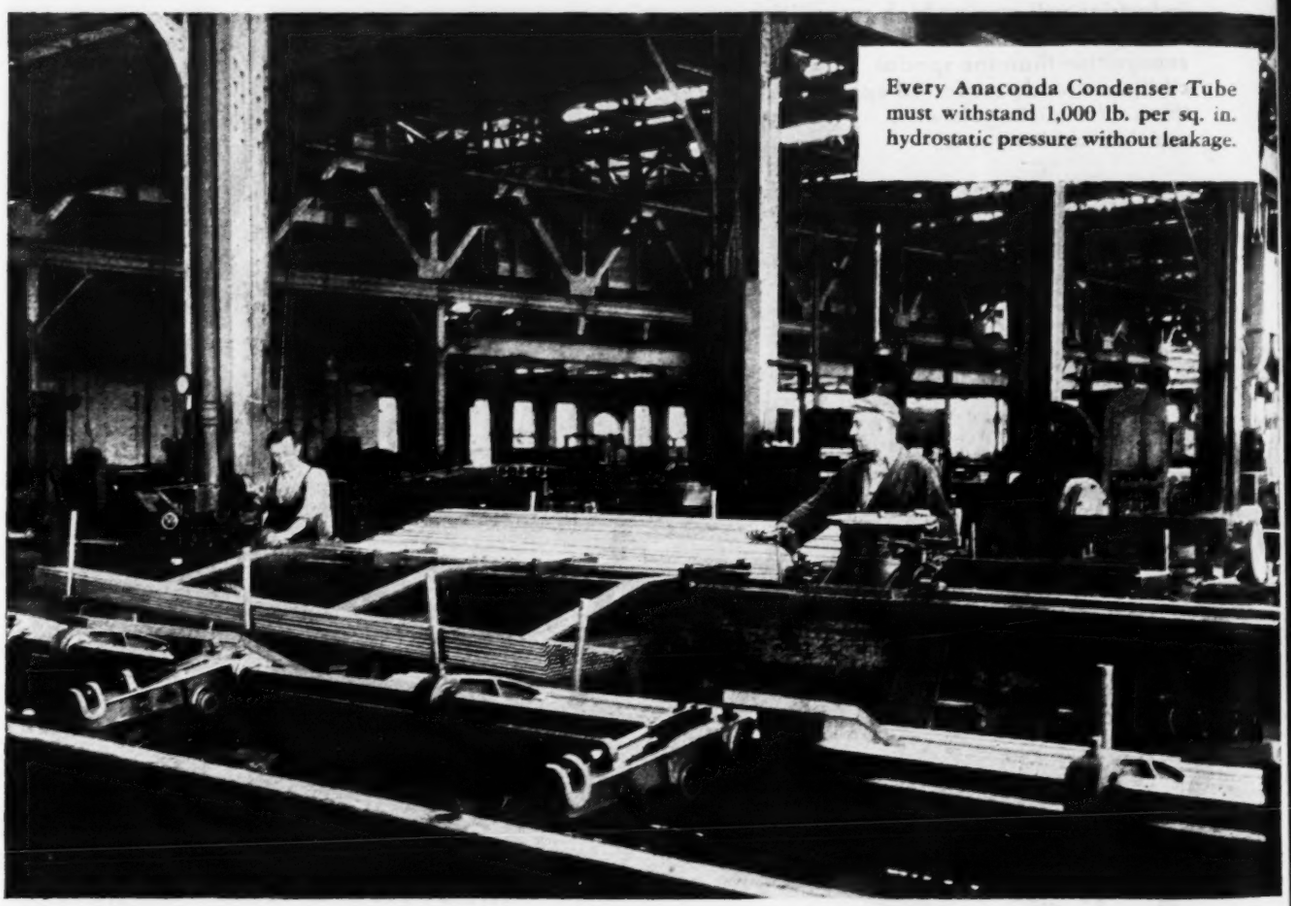
Each tube is subjected to hydrostatic test, surface inspection and checked for roundness, straightness, length, diameter and thickness.

Tubes from every lot of 600 undergo chemical analysis to check the alloy and microscopic examination to determine grain structure in accordance with A.S.T.M. Specifications.

The American Brass Company provides not merely accurate production in a wide range of Anaconda Condenser and Heat Exchanger Tube Alloys, but technical experience gained over the years in the study and solution of thousands of special heat transfer problems . . . all of which is at your service.

Publication B-2 lists Anaconda Condenser Tube Alloys, describes manufacturing processes, compositions and fields of application. We'll be glad to send you a copy. 4018?

BUY WAR BONDS . . . Buy more than before to shorten the war



Every Anaconda Condenser Tube must withstand 1,000 lb. per sq. in. hydrostatic pressure without leakage.

ANACONDA

Anaconda Condenser Tubes

THE AMERICAN BRASS COMPANY—General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company—In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

another Westinghouse **"FIRST"** in capacitor protection

BETTER WEATHER RESISTANCE with Zinc-Spray FINISH

Now, in addition to the exclusive Solder-Seal which protects operating elements, Westinghouse Capacitors offer new and greater protection against weather. Outdoor hanger-type capacitors are now *Zinc-Spray finished.*

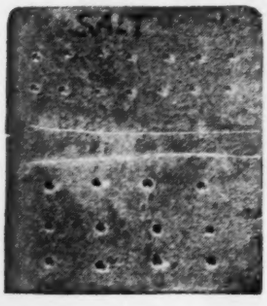
A zinc coating, five to six times the thickness of hot-dip galvanizing, provides a strong, durable finish that gives effective protection against rust and atmospheric corrosion. This new finish also has greater resistance to any abrasion encountered while units are being installed on poles. Even if scratches penetrate through the zinc coating, the zinc provides cathodic action to protect the steel.

Zinc-Spray means far greater life for outdoor capacitors and reduced replacement costs resulting from corrosion.

This new finish is now provided on all Westinghouse outdoor hanger-type capacitors . . . another advantage in the long list of outstanding Westinghouse capacitor developments. For more information about this new capacitor protection, ask your nearest Westinghouse office for R-1102, or write Westinghouse Electric & Manufacturing Company, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-90535

ZINC-SPRAY FINISH...

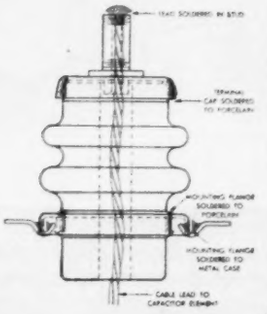
Photomicrograph of Westinghouse Zinc-Spray finish, magnified 100 diameters. Note firm bond between zinc and steel and the extra-thick protection of the .005 to .006-inch coating.



Steel sample, coated with Westinghouse Zinc-Spray, was tested by scratching and drilling through the finish into the steel base. After immersion in salt water and exposure through two months of wet weather in a corrosive industrial atmosphere, neither holes nor scratches show any sign of rust or corrosion.

. . . plus Westinghouse Solder-Seal

The solder-sealed bushing makes the capacitor completely hermetically-sealed. Metal-to-metal porcelain soldering by the exclusive Westinghouse process eliminates all gaskets, protects the working elements from moisture

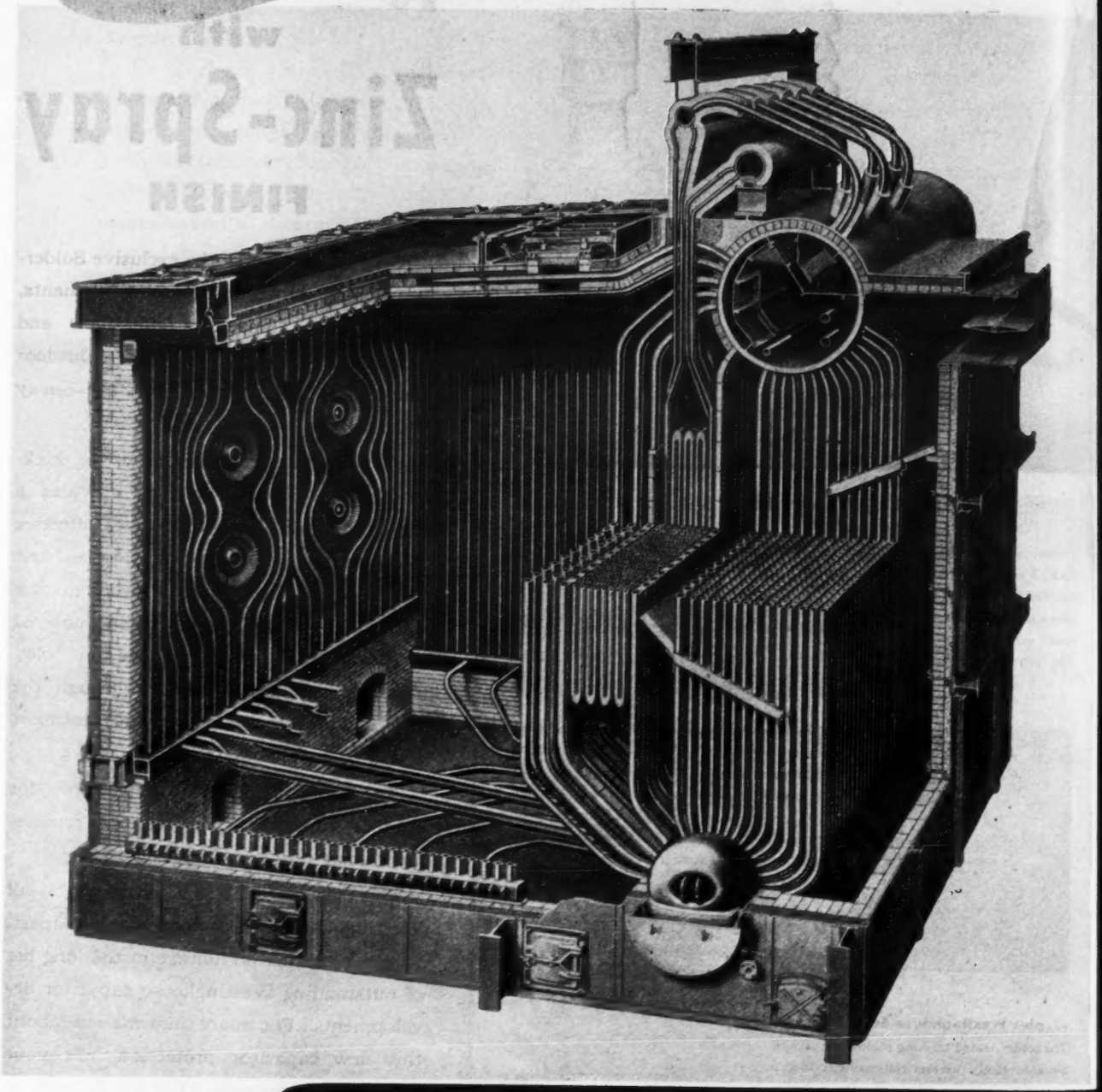


Westinghouse
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

CAPACITORS

Any way you view it

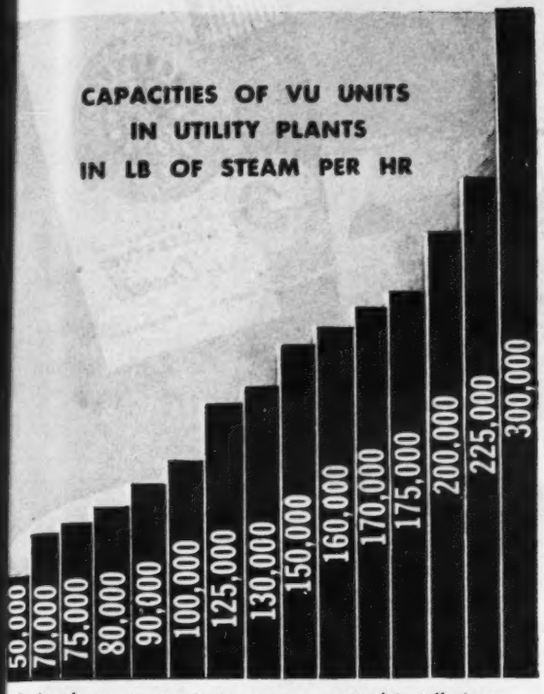
The VU



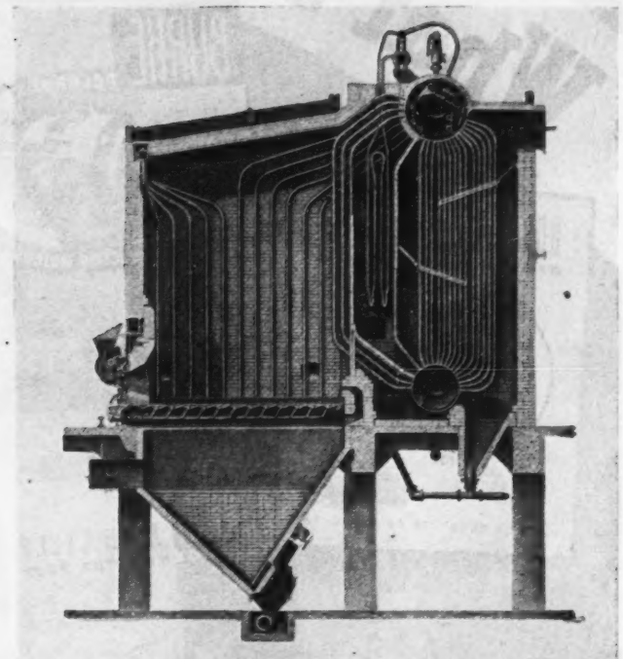
Cutaway view showing design characteristics of a typical C-E Steam Generato Type VU. Considerable latitude in arrangement of furnace, baffling, ash hopper, et is permissible without in any way affecting the advantages of the basic desig

C-E PRODUCTS INCLUDE ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATER

UNIT MEETS A WIDE RANGE OF UTILITY REQUIREMENTS



Each column represents one or more actual installations.



The VU Unit is adaptable to any method of firing. Here it is equipped with a Spreader Stoker.

t, specifically, is meant by a *wide* range of require-
ts? It includes all the usual items such as capacities,
sures, temperatures, fuels, space limitations and the
It goes much further – it includes, particularly in
case of utility installations, high availability and
efficiency. It extends to such important considera-
s as the balance between initial investment and long
e operating economy.

hat Combustion Engineering's VU Steam Gener-
meets all these requirements exceptionally well is
ed by the extent and variety of installations as well
erformance records. VU Units have been installed
tility plants all over the country from Massachusetts
California and from Minnesota to Texas. Capacities
hese units cover the range shown by the above chart;
gn pressures are from 150 to 1000 psi; steam tem-
atures range up to 900 F and higher. These installa-
s employ both pulverized coal and stoker firing
utilize the great variety of coals evidenced by their
graphical distribution. Many of them are fired by oil or gas and some by combinations of all three fuels.

The reliability of VU Units in utility service is evidenced by plant reports during recent war-time service of which the following are samples:

1. "The use factor for the combined units was 97%. The availability for the period was identical for both units, slightly better than 98%."

2. "Both units were on the line 16,191 hours during the year, a combined use factor of 92.4%. The combined availability during the same period was 96.1%."

Similar reports from other installations are available.

The VU Unit is designed for high efficiency. Actual efficiencies, depending upon fuels and operating conditions, range up to about 88%.

Designed and built to quality standards, VU Units are not sold – or bought – on price when first cost is the paramount consideration. But when a careful analysis of the balance between initial investment and long range operating economy is made, the real reasons for its widespread choice by utility engineers become apparent. A-844

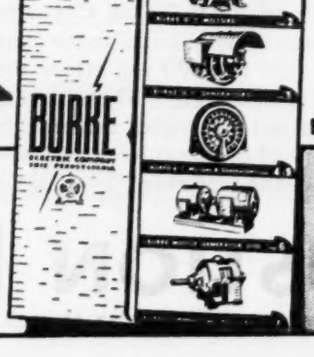
COMBUSTION ENGINEERING

00 MADISON AVENUE NEW YORK 16, N. Y.

What can BURKE do for Me?

HERE'S a quick look at Burke Products to answer the headline question. When you examine each booklet, more specific questions will develop, questions that Burke engineers will be glad to answer.

You may be surprised to learn that Burke pioneered and perfected the Universal Motor and the 3-Wire D. C. Generator, that Burke introduced the high cycle Motor Generator Set for powering High-speed Tools, and that Burke was first to use electric welding construction. In order to have you know Burke better we will be glad to send you a complete set of these Burke Bulletins.



For quick reference to the Burke line, see Sweet's Catalog File and Electrical Buyers' Reference Catalog.

BURKE ELECTRIC COMPANY • 1203 WEST 12TH STREET

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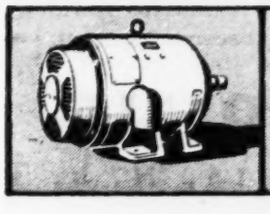
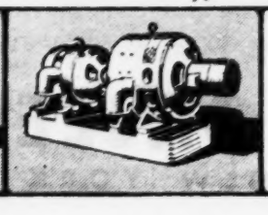
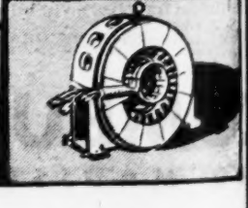
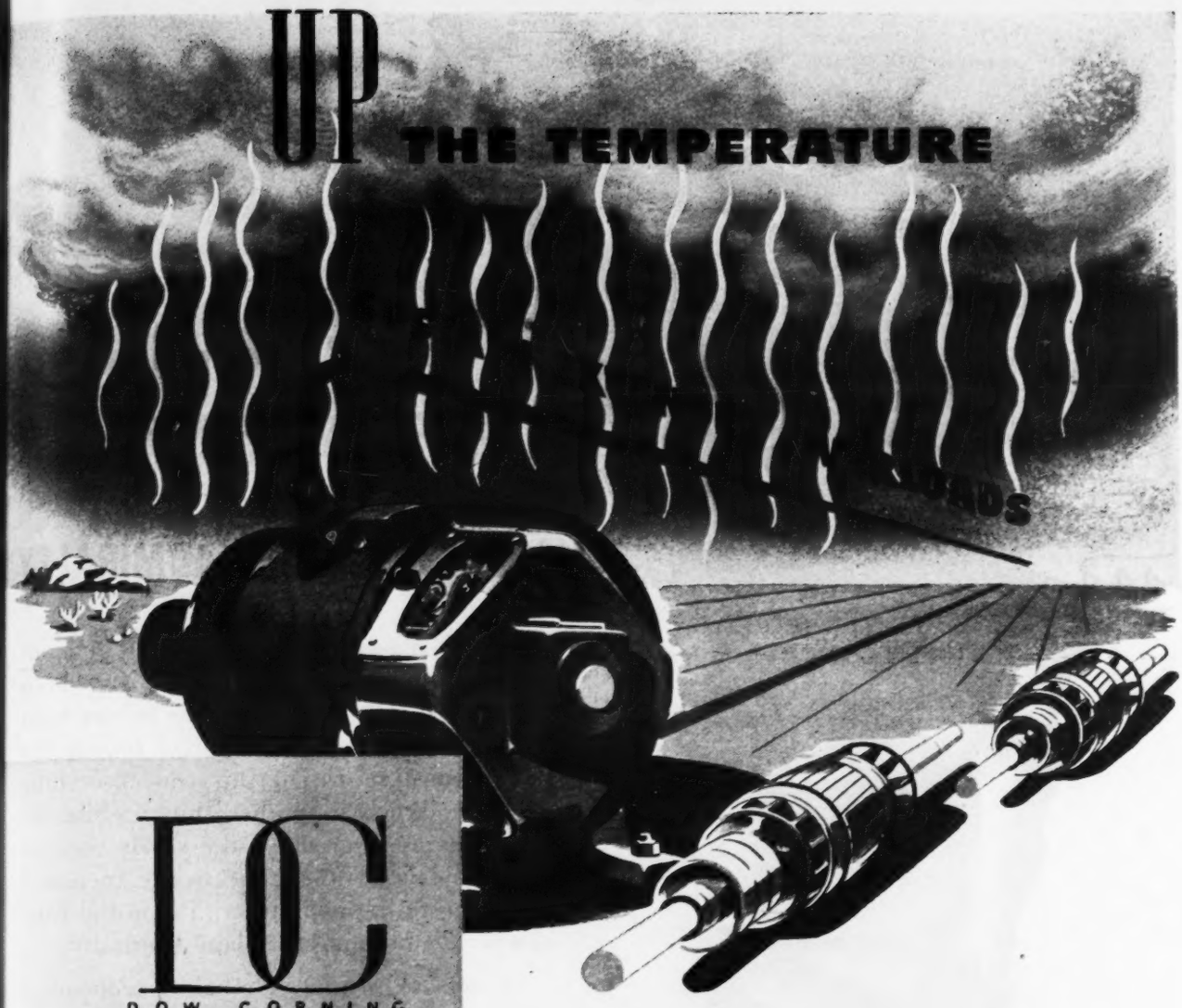




D.C. Equipment to 1500 H.P and 1000 K.W.
A.C. Equipment to 1500 H.P and 1000 K.W.
M-G Sets to 1000 K.W.
Molded Bakelite Terminal Blocks





DOW CORNING
VARNISHES

High Temperature Silicone Insulation

Dow Corning Silicone Varnishes are helping to create a new class of insulation—insulation in a class by itself for thermal stability, moisture resistance and freedom from overload failures.

They provide the bonding and filling medium for inorganic, or Class B, spacing materials such as Fiberglas, asbestos and mica, which are natural components of this type of insulation.

Dow Corning Varnishes open the avenue to the designing of more compact, lighter weight electrical equipment.

DOW CORNING CORPORATION
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DOW CORNING 993 . . . available in commercial quantities, is a heat curing, high temperature stable silicone varnish for impregnating motor stators, transformer coils and other electrical equipment; for varnishing Fiberglas or asbestos served magnetic wire; for varnishing Fiberglas and asbestos electrical insulating cloths, tapes, tying cords and sleeving; for bonding Fiberglas and mica combinations.

Dow Corning

Here's convincing proof of service life

with

CHASE ANTIMONIAL ADMIRALTY*

During the past nine years, *millions* of pounds of Chase Antimonial Admiralty have been installed . . . yet not one service failure from dezincification has been reported to mar the performance record of this condenser tube alloy. And here's another thing: while the antimony greatly reduces the yearly costs of your condenser tubes (due to the increased resistance to dezincification), the initial tube cost is no more than for plain Admiralty.

If you are seeking a reliable, economical condenser tube for salt or brackish cooling water conditions, you need look no farther than the *proved* performance record of Chase Antimonial Admiralty.

KEEP THIS IN MIND — Chase Antimonial Admiralty offers you outstanding service life because it is (1) highly resistant to dezincification; (2) virtually immune to stress-free intercrystalline corrosion; (3) costs no more than plain Admiralty.

For details phone your nearest Chase Warehouse or Service Office.

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SPECIAL STOCKS OF ANTIMONIAL ADMIRALTY at HOUSTON LOS ANGELES NEW ORLEANS SAN FRANCISCO TULSA

CHASE BRASS & COPPER CO.

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This is the Chase Network — handiest way to buy brass

Inside story of a fighting gadget

It's not much larger than a hand. You can see that. But this little machine has a big responsibility and packs a lot more than a fistful of wallop.

Its job is moving flaps and shutters on America's fighting planes. It has to be powerful. It has to be light. It has to be compact and super-dependable.

Making it was a big order. The way Lear did it was through sheer engineering ingenuity and almost unheard-of precision in production.

Today this Lear Actuator and the tiny, powerful electric motor that runs it are fighting gadgets. But in the days ahead there should be many important applications for such devices.

So we tell you about them now. Then you will know that such things are available as well as the kind of engineering thinking and production technique that made them possible.

PLANTS: Piqua, O., and Grand Rapids, Mich.
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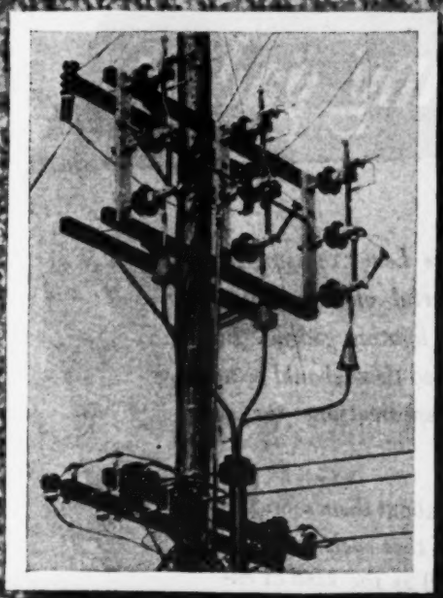

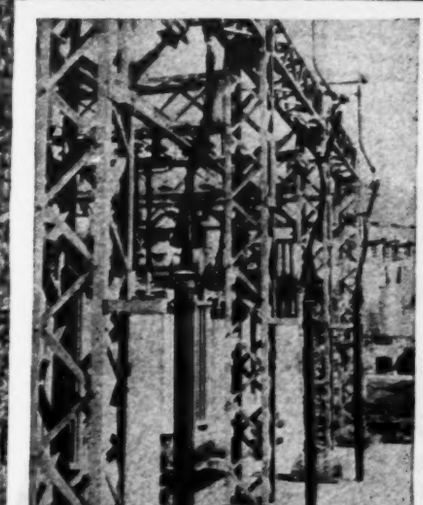

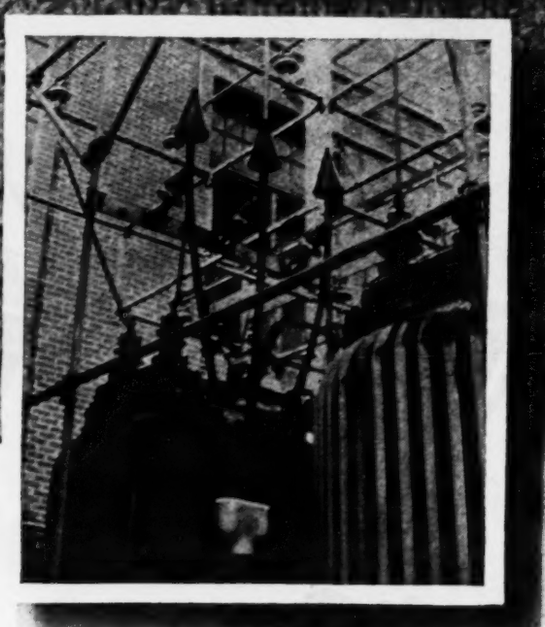

SAFE AND SIMPLE TERMINALS are one of the accomplishments made possible by **KERITE ENGINEERING** and the characteristics of Kerite insulation.

THE KERITE INSULATED WIRE & CABLE COMPANY INC

NEW YORK CHICAGO SAN FRANCISCO

Pioneers in Cable Engineering

THE FAR EAST

Frontier for American Enterprise

IN THE great tradition of America, our frontier lies to the West. But for a United States that stretches from the Atlantic to the Pacific, to Go West is to arrive in the Far East. The feet of literally millions of our young men are now set upon that route.

Accomplishment of their objective—the defeat of Japan—will not end our responsibilities to the Orient any more than the defeat of Germany will end our responsibilities to Europe. This time we mean to see the venture through.

The first sketch of a political program for enlisting the strength of nations of good will to enforce the peace was drawn at Dumbarton Oaks. That is a good start. But those who participated know how much work remains before the blueprint becomes a fully matured plan, the plan becomes a structure, and the structure takes life and effective being in the living imagination and will of the peoples of the world.

No political accord, however high its purpose, can endure for long if it depends upon the loyalty and support of populations embittered by hopeless poverty that is offered no promise of relief. The poisonous dust of mass despair makes inevitable an ultimate explosion, whether it be sparked by a torch supplied from without or by its own internally generated heat. Much of the Far East is sufficiently close to that position to pose a grave problem to the Western world. It is of particular importance that American business men and workers alike recognize the nature of their responsibility in the matter, for to them the great area of the East presents also an opportunity and a challenge.

☆ ☆ ☆

The Orient—stretching in a vast semicircle from Manchuria and Japan to India and Ceylon—is the home of more than a billion people, the world's greatest potential market. In its mountains are the earth's richest stores of tin and mica; its deposits of iron ore, coal, and manganese rival those of France, Russia, and the United States. Its rice paddies are the most productive in the world, its coconut and rubber plantations the largest, and its cotton production is of major volume.

And yet, this fabulous region—with its riches of manpower and raw materials—suffers from living standards at the lowest rung of the world scale. With as much as 85 per cent of the populations of this great area devoted to the production of farm products, starvation has been an endemic plague to countless millions of its inhabitants, and will remain so until they graduate from the crudely primitive methods of the crooked stick and the bamboo plow to the use of the implements of a modern world in both agriculture and industry.

The improvement of agricultural methods and the burgeoning of industrial development depends upon tools—a preponderance of simple tools, no doubt, at the beginning, for modernization of economic processes is a development that cannot be forced at a rate faster than the ideas upon which they depend can be developed. If we, in the United States, are to hope to supply a major portion of the implements upon which the salvation of the East depends, we must be prepared to export also the skills and technologies which will make their effective use possible.

The possibility of a world market for machinery and manufactured products is a challenge that American industry cannot afford to ignore. The United States will emerge from the war with almost half of the world's industrial capacity within its borders, with much more than half of the heavy industries. Drastic and painful readjustments are inevitable; but they can be mitigated to the extent that we can find outside markets for the products for which we have excess capacity.

We shall find ourselves, at war's end, in a singularly favored position to compete in any equipment markets which are open. It is not merely that we shall have the productive capacities crying for outlets. Aside from Germany and Japan, which for some time will not be in a position to compete, our two major industrial Allies, Great Britain and Russia, will face enormous tasks in providing for their own rehabilitation. Neither of them is likely to be in a position to export more capital than they absorb; and although Canada, Sweden, and Switzerland will be, the United States will stand alone as the one major creditor nation in the world. If the potential advantages of this position are managed with wisdom and imagination, they will enormously enhance our opportunities for supplying a great share of the capital goods demand of undeveloped areas.

☆ ☆ ☆

What is the dimension of the Far East's potential demand? What are some of the difficulties standing in the way of its being realized?

If needs were the only measuring stick, the Far Eastern market would provide a bottomless pit into which even the great stores of our exportable capacity could be poured with room to spare.

China, alone, with its teeming population of 450 millions, has spelled out needs in dimensions large enough to stir the imaginations of the equipment producers of the world.

Business Week (February 5, 1944) supplements Dr. Sun Yat-Sen's spacious first estimates of the requirements for a thorough-going industrialization program with figures provided by current Chinese planners—25,000 locomotives; 300,000 freight cars; 20,000 passenger coaches; 20,000,000 tons of steel; and 90,000 power driven machine tools for the first five years of reconstruction. An American manufacturer of farm equipment, who recently surveyed the agricultural requirements of China, estimates an ultimate Chinese market for 20,000,000 tractors.

India's drawing-board plans are equally expansive. According to the bold pattern drawn up by a group of Bombay industrialists—some of whom are due to visit the United States early in 1945—India, after the war, will require a capital investment of $2,000,000,000 a year over the next 15 years, of which $250,000,000 per year for the first seven years will be in the form of imported capital goods.

Included on the huge import order list of the Bombay executives are mining, roadbuilding and power station equipment, heavy locomotives, metallurgical plants, agricultural machinery, and a long list of machine tools.

There can be no question of the need of these countries for the industrial equipment—and for many items of manufactured goods—which we are so eminently in a position to supply. But realism requires that we measure this demand against the Far East's probable capacity in the relatively near future to absorb industrial goods.

A Chinese economist has estimated that China, in 1937, had a total industrial capital investment of about $1,000,000,000 in American values, or something like $2.50 per capita of population. In contrast, the American investment, in manufacturing facilities alone, is now more than $600 per capita.

What it could mean in terms of capital goods requirements if China alone carries out this dream of modernizing, not to the utopian level of the United States but to the present modest level of the less developed Soviet Union, is typified by measuring just three lines: 500,000 tons of steel a

year, for five years, to add 12,500 miles to the railroad system; 2,187,500 motor vehicles; 3,300,000 telephones.

But it is one thing to cite mountainous figures demonstrating needs. It is another, and far less optimistic exercise, to find assurance that practical opportunities for satisfying such needs can be made to materialize. Let us face some of the major difficulties and see if they are insurmountable.

☆ ☆ ☆

The first hurdle to be cleared is the question of whether or not we want to promote the industrialization of the Far East. The wisdom of doing so has been vigorously challenged. The negative argument, on the economic side, generally runs thus: If we provide industrial equipment to backward economic areas, we deprive ourselves of the greater long-run opportunity of selling them manufactured articles which our aid has enabled them to produce for themselves.

It is only fair to say that such a thing might happen—that it has happened in isolated instances in the past. But the overwhelming weight of economic history demonstrates that the broader attitude is also the profitable one.

The United States itself is the living refutation of the fear which now cramps the outlook of many of its own citizens.

From 1790 until 1850 the foreign trade of our new fledged Nation had many of the characteristics which pertain to the trades of China and India today. We imported manufactures and we exported raw materials, agricultural products, and newly mined gold. Our imports exceeded exports, the difference being made up partly by payments to us for shipping services and partly by industrial development loans. It is relevant to inquire how the trade of the lenders was affected by this policy of supplying us with industrial capital and machinery.

From 1850 through 1939 the pattern of America's foreign trade changed. Slowly at first, and then at accelerated pace, our import ledger showed a percentage decline in manufactured goods and a percentage rise in raw materials to feed our expanding industrial facilities. But while finished manufactures declined percentagewise in our import budget, so great was the increase in our total foreign trade operations in the century from 1830 to 1930 that our imports of manufactured goods increased more than twentyfold, and they more than doubled between 1900 and 1939.

Clearly industrial Europe gained rather than suffered from the industrialization of the United States, and it is equally clear that we, in turn, shall benefit from the industrialization of the world's undeveloped territories. Further evidence is provided by Canada which, with its high industrial development but only 12 million people, buys from us each year almost as much as the relatively unindustrialized 130 million people south of the Rio Grande.

If it be granted, as I believe it must, that the development of Far Eastern countries will be to our advantage as well as theirs, the second question that we should face is the speed with which it can be accomplished. Is there genuine promise in the proximate future of opportunities for American enterprise of the magnitude set forth in the estimates quoted above?

In all fairness, I am forced to state my conviction that the road is longer than is indicated by Chinese and Indian leaders. It is natural, and far from censurable, that their eyes should be focussed upon the urgency of national needs, rather than upon obstacles in the way of their fulfillment.

On the other hand, it is possible that our own long process of industrialization may lead us to conclusions of undue conservatism. Ideas, once they break the crust of resistance are the most contagious of bacteria, and the tempo of their infiltration seems to increase by geometrical progression in a world of swift communication.

☆ ☆ ☆

In an interesting recent study of The International Labor Office, it is suggested that the general economic level of the rest of Asia outside Japan in the late 1930's was not dissimilar to that of Japan in 1900. Between 1900 and 1936, Japan increased its total capital investment more than threefold devoting between 10 and 17 per cent of its annual income to capital outlays. A comparable tempo of development for China, India, and other Asiatic areas would result in a capital expansion that would dwarf to insignificance the most optimistic blueprints that have been put forth to date. I am not suggesting this as a likely possibility, but rather as a caution lest we, in the name of hard-headed realism, underestimate Asiatic potentials as much as their own nationals exaggerate them.

Finally, in appraising the outlook for American enterprise in Far Eastern markets, we collide, head-on, with the problem of how we are to be paid. Here, hard-headedness can be only a virtue, for the lack of it will breed inevitable disaster for the Asiatics as well as for us.

In the last analysis, the dimension of the American market in the Far Eastern countries will be determined by the dollar exchange at their command, obtained through the products, goods, and services which they are able to provide to us, with due allowance for multilateral trade arrangements. It is true that the balance temporarily can be distorted through the extension of developmental loans. There is little question but that such loans will be in order after the war, and if they are wisely made, for productive projects that eventually will increase the exporting capacities of the countries to which they are extended, they can be thoroughly justified. But the best loans provide only a temporary expedient. In the long run, the balance of current payments must be restored with sufficient margin to provide interest payments and finally amortization of principal.

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How, then, are we to attack the problem of increasing our imports from the Orient?

In 1937, the total exports of the Far East amounted to something over $3,000,000,000—a little less than $1,500,000,000 in foodstuffs, a little more than $2,500,000,000 in raw and partly manufactured materials, and better than $1,000,000,000 of manufactured articles. Of this total, the United States purchased only about 20 per cent—approximately 10 per cent each of the foodstuffs and manufactures, and 30 per cent of the materials.

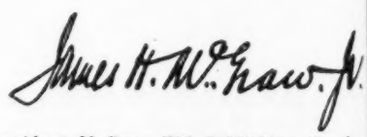
Despite changes in our technologies which will probably reduce our future takings of such important items as rubber and silk, the achievement of a high level of economic activity in this country after the war will provide a basis for increasing our Eastern imports, but only if it is an accepted part of our national policy to do so.

This means an alert and aggressive exploration of two-way trade possibilities on the part of both American business and our governmental agencies. It cannot be done by either alone.

The war has dislocated many of the trade patterns that prevailed in the past. The East is hungry for the type of products which we, uniquely, are situated to supply, but it will make its bargains with those who will not only fill its needs but will also provide outlets for its produce. Even the prewar magnitude of the exports from this area provides ample margin for the most meticulous and imaginative shopping of Eastern markets with the aim of increasing the modest share of our prewar purchases. And a farsighted program of development loans can greatly increase the capacity of these countries to produce what we want.

In general, we can trust American enterprise to explore rigorously all likely export opportunities. But the equally vigorous investigation of import possibilities will require a break from past traditions on the part of American business and American government.

Both East and West must learn to think in new patterns for the successful opening of a new frontier.



President McGraw-Hill Publishing Co., Inc.

Electrical World
DECEMBER 9, 1944

Why Private Operation?

WHY SHOULD the public be served with electricity by privately owned utilities?

For years this subject has been before the American people and, while it had died down somewhat in the past three or four years, it is bound to come to the fore again, particularly in the distribution of government-generated power from new developments. So let's put it out on the table where all can look at it.

That the utility companies pay taxes or represent private initiative or are already in business isn't going to be enough. The public cannot be expected to be satisfied with anything short of benefits it can understand.

Do such benefits exist? Does the industry know what they are? Do the employees of the industry know them?

Recently there was published a book on the TVA development by the head of the project. It has had a wide distribution and has helped to sell the idea all over the country—the idea of what? The idea of the benefits that come to people from development of a valley. In fact, the subject has become a popular one for magazines and even now another new book on the subject has just come off the press.

What has the TVA got that the electrical industry does not possess? For one thing it has an appreciation of its own works and the desire to "tell the world."

How many cities owe a large part of their development to the local electric power company? How many industries did it help to locate there? What have utilities done to develop the resources of their states and to encourage local education? What has been their contribution to better farming, community projects, soil conservation, irrigation, river development? Who is it that is first to sponsor local improvements and employment, to keep industries home, to head up C.E.D. work, community chests, drives?

Is it that the privately owned power companies have been so close to their communities, so much a part of them for so long that they cannot appraise their own contributions? Perhaps so, but the fact is that the people will never know until somebody tells them.

In the past the utility people have done most of their work in connection with some community body and have permitted the credit to go to others. Some way must be found, in the future, for the public to know who carried the ball.

If the industry doesn't have the facts—and only facts will count—then it should employ someone to get them—and get them quickly. When the Bailey amendment to the Flood Control Bill came up, senator after senator doubted that the power companies had contributed to the development of their states. There was no answer by the friends of the amendment because they did not have the facts.

The private power industry must know by this time that it cannot continue to exist for long unless it is making a contribution to the community it serves. It is not enough to provide good service at fair rates. Facts, when learned by the public, will do more than anything else to preserve private operation. It's time the industry stopped clamoring against the public ownership advocates long enough to learn something about the way they build up public acceptance of their operations.

Earth Ambient Temperatures for Cable Loading Limits

Seven-year observations of temperatures of air and of earth at depths up to 12 ft. reveals seasonal range as indicating permissible seasonal loading of similarly placed paper-insulated cables

G. HIERONYMUS, Kansas City Power & Light Co., Kansas City, Mo.*

TREND IN CABLE operation is toward heavier ampere loading wherever and at such times as this can be done without undue shortening of the life of the cable insulation. Both place and time of year are determining factors because they have a bearing on the ambient temperature and therefore the ability of the surrounding earth to dissipate the heat generated by the electrical losses incurred in the cable.

Such advantages as can, therefore,

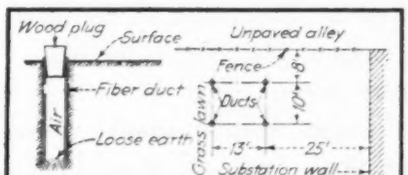


FIG. 1—Dimensions and locations of the fiber duct test holes

be taken of marginal capacity in cables hinges on a knowledge of the characteristic temperature behavior of the earth at various seasons and depths. Another factor is the heat absorbing and conducting properties of the particular earth or fill at each point along the duct route.

The first of these factors has been a matter of study in Kansas City with the objective of establishing, if possible, a base for ambient temperature. The bulk of the consecutive observations have been made since 1927. Major conclusions reached are these:

1. The greater the depth the less the seasonal variations.

2. For the loess (silt loam) at the test location the "sink" value at which there is no apparent response to the variation of surface air temperature is at about 24 ft.

3. There is relatively little change in the cyclic levels from year to year, particularly at 8 and 12-ft. depths.

4. The amount of time lag between surface air and earth temperatures at various depths will be found to vary with the kind of soil at different locations and at different depths at a given location.

Method of Observation

Fiber conduits were installed on end in the grass lawn of a transformer substation in a residential district where it appeared that there would be the least interference from sources of heat other than the normal effects of

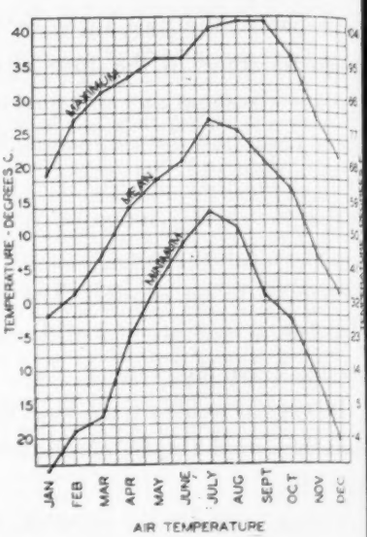


FIG. 3—A composite of full year's air temp. shows range from —25 deg. C. in January to + 42 deg. C. in late summer

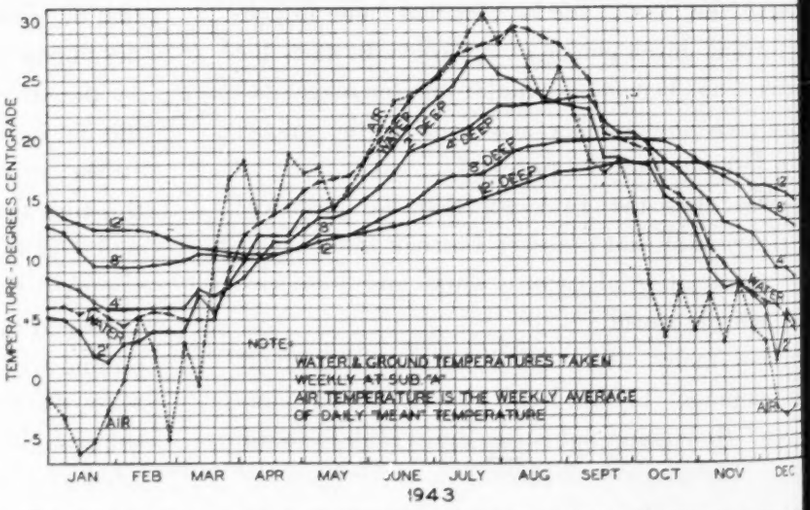


FIG. 2—Temperatures for air, water and ground (various depths). Water and ground temperatures taken weekly. Air temperature is the weekly average of daily mean temperatures. All readings are for the year 1943

* Superintendent Underground Systems

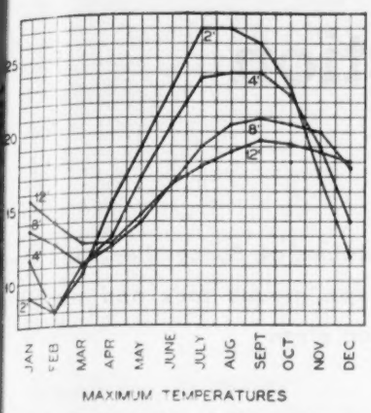


FIG. 4—A composite of the maximum values of ground temperature of the seven years shows seasonal range of 19 deg. C. at 2-ft. depth and only 7 deg. C. at 12-ft. depth

ir temperature. These conduits were of 60 percent woodpulp and 40 percent tar base compound, 4½ in. in diameter and of the type commonly used in underground conduit construction. They were two, four, eight and twelve ft. long respectively and spaced about ten feet apart with the top end flush with the ground surface (Fig. 1). Tapered wooden plugs were inserted in the outer end to keep out dirt, water, etc.

Conventional Thermometer Used

A conventional mercury thermometer was attached to a string and lowered into the hole to ascertain the temperature. When there was a considerable difference between the temperature of the earth at the bottom of the hole and of the air there was a tendency for the thermometer to change rapidly when it was removed for reading. To minimize this effect, a piece of soft copper wire was wrapped around the glass bulb to produce adequate lag in the transfer of heat to and from the bulb.

There was no appreciable error in the temperature reading at the bottom of the hole resulting from the gradient in the air column when the wooden plug was kept in place at the top except for the few seconds while the thermometer was being inserted or removed. A bit of loose sand at the bottom of the hole imparted the correct temperature to the thermometer bulb despite the variations in the air column.

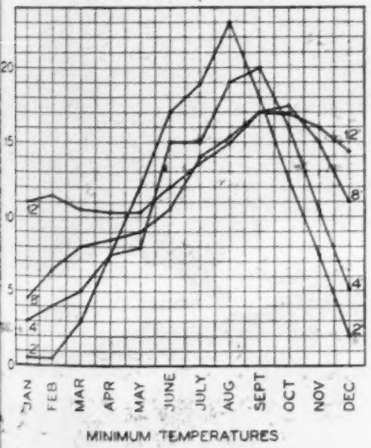


FIG. 5—A composite of minimum temperatures shows the range to be about 23 deg. C. at 2-ft. depth and only 7 deg. C. at 12-ft. depth

Nature of Soil

Earth where the tests were made, is a type of brownish yellow clay which will stand for years without erosion. Technically it is called loess and is specifically known as Marshall silt loam and Summitt silt loam. Analyses of samples by the geology department of the University of Missouri showed the following characteristics:

Physical Analysis (Percentages)

Fine gravel	0.0
Coarse sand	0.1
Medium sand	0.2
Fine sand	0.4
Very fine sand	2.9
Silt	69.1
Clay	27.3

Chemical Analysis (Percentages)

Silica	70.11
Alumina	14.25
Iron oxide	4.02
Potash	2.03
Lime	1.53
Magnesia	1.32
Soda	1.09
Moisture	2.48
Loss of ignition	3.50
	100.33

The soil makes very fine brick. It burns hard at 2,000 deg. F., vitrifies at 2,150 deg. F. and melts at 2,300 deg. F.

Test Details

Tests of ground temperatures have been made once each week on the same week day when possible. Tests were also made of the temperature of the water in the city mains at the same location.

The daily mean air temperature from the weather bureau was averaged for the week to get a weekly value for air to go on the curve. This is shown in Fig. 2 which is a typical curve of the weekly values for a year.

There is not much difference in the relative values from year to year. The only advantage of the combining of several years of tests seems to be to minimize the effect of a few abnormal readings upon the average values obtained.

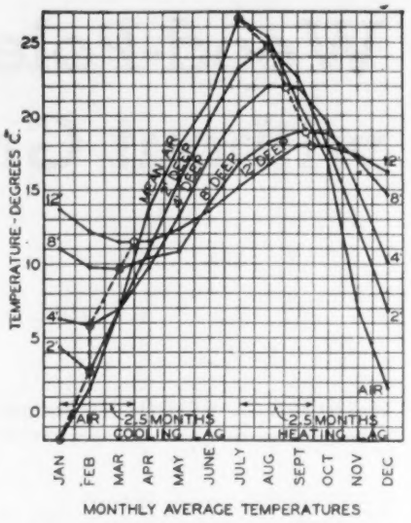


FIG. 6—A composite of monthly temperature averages for seven years. Note the heating and cooling lags as indicated by the displacement of ground minima and maxima from the corresponding air values

The maximum value shown (Fig. 4) for any one month, e.g., August, is the highest value ever read during any August of the several years covered by the survey. The same applies to the minimum values. (Fig. 5.) The average value shown for any month is the average of the weekly readings during the same month of all the years covered by the tests.

Much valuable information, it is believed, will be found in Fig. 6, which shows the average of all the years covered by the survey and for the different depths. The heating and cooling lag between the air and the earth is significant. Approximately two and one-half months are required for the air temperature to produre its effect at 12-ft. depth in the particular soil at the test location.

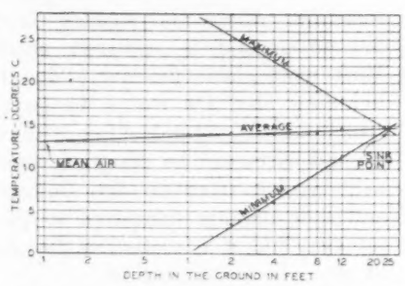


FIG. 7—At about 24 ft. the variation in air temperature seems not to affect the ground temperature

Wood-Pole Line Protection without Ground Wires

Minimized outages and damage obtained on Bonneville-Grand Coul 115-kv. lines by using diverter gaps, ground rods and wood-ins ated guys—Estimated cost reduction given

HAROLD L. RORDEN, Bonneville Power Administration, Portland, Ore.

RECENT OBSERVATIONS and experiments by the Bonneville Power Administration have revealed an advantage which may greatly add to the usefulness of wood in the elimination of outages and damage without resorting to overhead ground wires. It is found that power arcs on wood-pole lines do not follow the path of lightning flashovers along crossarms and down wood poles to ground. Although poles may be split or gouged by lightning, when an accompanying outage occurs it is due to a flashover at the nearest guyed structure, where the spacing from line to ground is relatively small. Most multi-phase flashovers due to lightning also are traced to guyed structures. Wood-pole lines without ground wires can be designed which will involve relatively few outages and little damage compared to past practice, and at a fraction of the cost of ground-wire protection.

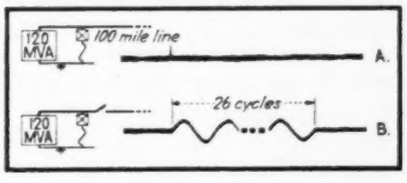


FIG. 1—Oscillograms, to the same scale, of surge (volt-amp.) initiated by a 50-ft. fuse wire

A. With 100-mile transmission line the arc was not sustained, and no outage occurred. The oscillogram of current shows no similarity to a 60-cycle wave

B. With no transmission line the arc was sustained until cleared by relay action

All 115-kv. lines of the Bonneville system in the lightning area east of the Cascade Mountains are of wood-pole, H-frame construction without overhead ground wires excepting within one-half mile of stations. During lightning investigations in 1942 it was observed that when lightning struck a conductor on a wood-pole line there was usually a multiplicity of damaged structures in the near vicinity. Ordinarily from four to twelve poles were gouged from crossarm to ground, numerous insulator strings were flashed over, and usually more crossarms were split than poles were gouged. The outstanding observation of this damage was that in every case no evidence of power arcs could be located on any structures that did not contain grounded guys. Guyed structures average about two to three miles apart and invariably when a stroke was located, power-arc burns would be found on the nearest guyed structure, sometimes over a mile from the location of the stro

These observations led to the co jecture that power arcs do not foll lightning flashovers over relativ long paths such as wood poles. It a peared that when lightning strikes line it flashes over at the near structure, the stroke following o the insulator string and crossa and down the pole to ground. B cause of the absence of a gr ground, the rate of dissipation of e ergy is relatively slow so that a trav ing wave of high magnitude rema on the line and flashes over at sever successive structures in both dire tions. Phase-to-phase flashovers o cur frequently, sometimes involvi all three conductors. The wave a tenuates rather rapidly so that no fu ther damage occurs beyond perha a half mile from the point stru however, somewhere down the li

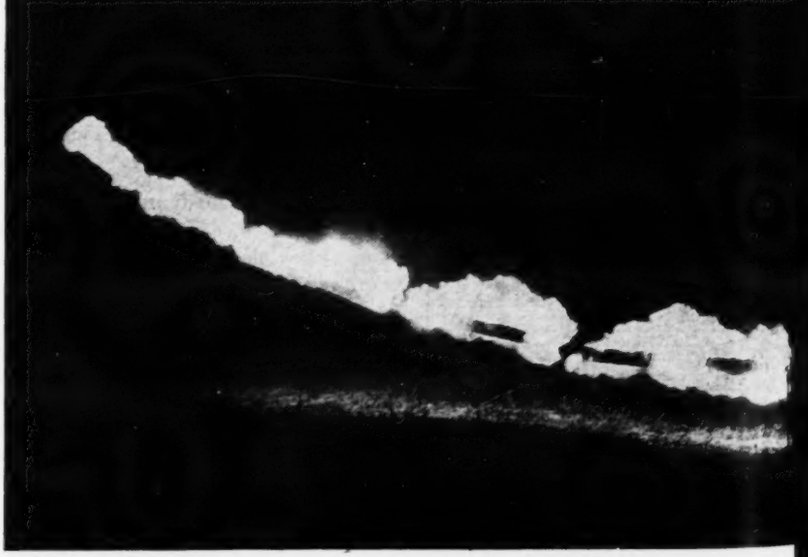


FIG. 2—60-cycle power arc corresponding to oscillogram of Fig. 1. Fuse wire la along five 10-ft. lengths of wood

wave reaches a guyed structure re the total distance from conduc- o the grounded guys is only about t. through space, or 9 ft. over in- lators and crossarm instead of 50 60 ft. to ground at the unguyed uctures. There is enough potential flash over this gap because of this tively short distance and a power follows resulting in an outage.

Guided by this experience tests e conducted at the North Bonne-

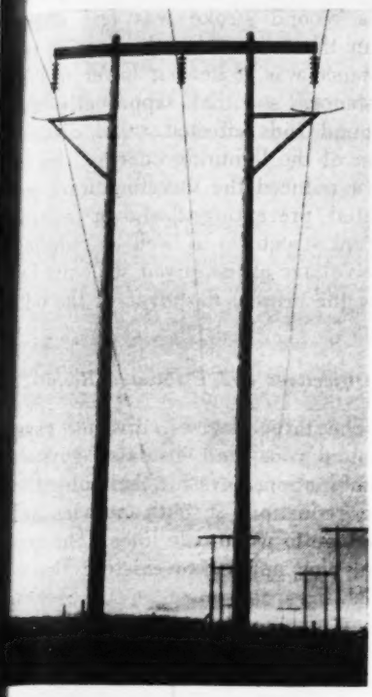


FIG. 3—Diverter gaps on 115-kv. circuit. Mounting brackets are wood. One-half inch S. M. strand runs along diagonal brace to pole. Two 8-ft. ground rods at base with ½-in. S. M. strand connecting

ille substation in an effort to deter- ine the optimum distance for power rcs to follow over paths flashed over y lightning. The power arcs were itiated by means of a fuse wire, nce a surge generator was not avail- ble. Voltage was applied by closing breaker, thereby impressing 138 v. on the fuse wire (230-kv. circuit) nd with 120,000 connected kva. rom the Bonneville powerhouse sup- lying the energy. It was found that ith 100 miles of 230-kv. line con- ected, power arcs would not strike ver a 50-ft. fuse wire of number 33 opper. When voltage was applied, he fuse wire melted with a sharp re- ort, but no power arc followed and he line remained energized. The os- illogram shows that only a current

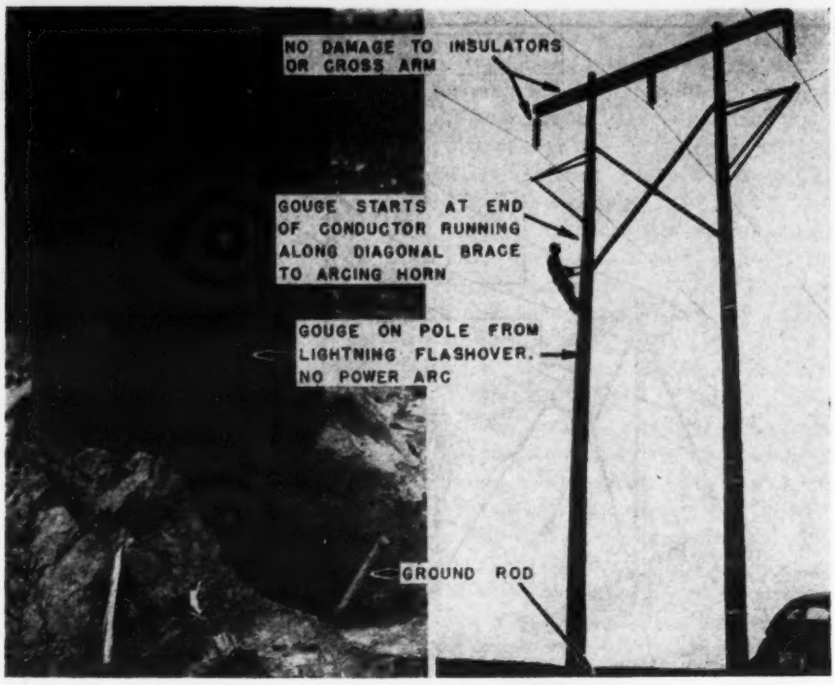

NO DAMAGE TO INSULATORS OR CROSS ARM
GOUGE STARTS AT END OF CONDUCTOR RUNNING ALONG DIAGONAL BRACE TO ARCING HORN
GOUGE ON POLE FROM LIGHTNING FLASHOVER. NO POWER ARC
GROUND ROD

FIG. 4—115-kv., H-frame, wood-pole structure equipped with diverter gaps and ground rods, flashed over by lightning. No insulator or crossarm flashover and no power arc at this structure

Left: Base of pole showing gouge terminating at ground rod

Right: Lightning streak confined to pole only between gap and ground rod

surge occurred when the fuse melted. The current that fused the wire did not develop into a cyclic power arc.

With the 100-mile line disconnected, the power arc was initiated and sustained over a 50-ft. fuse. The oscillogram of the 50-ft. arc shows that the power arc persisted until extinguished by relay action. The photograph shows the arc initiated by the 50-ft. fuse, when the test circuit consisted only of the one mile of line from the transformers at the station to the switchyard.

These tests are probably not comparable to lightning flashovers in several respects, but were considered to suffice for determining if the power arc would sustain itself once it was initiated. The tests could not be completed due to war conditions, but they lent confidence to the observations on the 115-kv. lines during 1942 that 70-kv. line-to-ground power arcs did not follow down the 50-ft. wood poles to ground.

Diverter Gaps Installed

Based on the foregoing evidence experimental installations of diverter gaps, ground rods, and wood-strain insulators were installed in some sections of the 115-kv. line where the first observations were made. The diverter gap consists of an arcing horn supported on a wood frame with ½-in. Siemens Martin steel wire running from the horn along the diagonal wood brace to the pole and terminating about one foot below the point of support of the diagonal brace on the pole. The function of this gap is to divert lightning strokes that hit the conductor so that they will be directed down the pole without flashing over the insulators or crossarm. The lightning stroke in passing to ground must strike over about 40 ft. of wood on the pole. Experience to date shows that somewhat less than one percent of such flashovers results in sufficient damage to the pole to require repair. A gouge about 1 in. deep and from one to 3 or 4 in. wide usually results from such flashovers. It may be possible to eliminate the gouge and achieve the major objective by running a fuse wire down the pole, but this method has some obvious limitations.

At the base of the structure an 8-ft. ground rod is driven at each pole and these are connected by ½-in. SM wire just below the surface of the ground. The function of these ground rods is to permit dissipation of the energy of the lightning stroke more rapidly so that the traveling wave

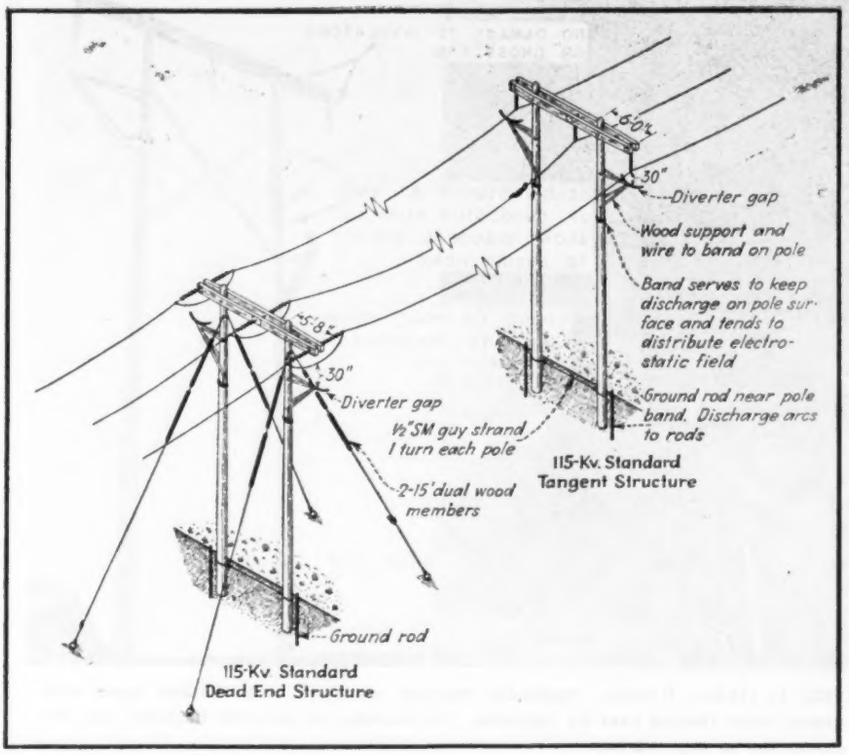

6-0"
30"
Diverter gap
Wood support and wire to band on pole
Band serves to keep discharge on pole surface and tends to distribute electrostatic field
Ground rod near pole band. Discharge arcs to rods
115-Kv. Standard Tangent Structure
5'-8"
30"
Diverter gap
½"SM guy strand 1 turn each pole
2-15' dual wood members
Ground rod
115-Kv Standard Dead End Structure

FIG. 5—General plan of protection using diverter gaps, ground rods, and wood-insulated guys on dead end and tangent structures

will be of lower magnitude and duration and thereby prevent flashovers on many successive poles along the line.

At guyed structure 16-ft. wood-strain members are inserted in guys with the object of increasing the lightning flashover at this point so that unless the stroke occurs very near this structure, the traveling wave should not cause a flashover at this point. The wood members if long enough, also serve the purpose of adding a considerable length to the flashover path so that in the event of a stroke very near the guyed structure, although a wood guy may be split, no outage should occur. These wood members are not equipped with arcing horns for the obvious reason that although such horns would eliminate damage they would encourage an outage.

Experience Successful

The line equipped with these experimental devices was struck recently on two separate occasions in the same vicinity. The area struck is equipped with diverter gaps and ground rods, but not with insulated guys. The first of these strokes was accompanied by an outage. Lightning struck an outside conductor near the structure shown, flashed over the diverter gap, followed along the conductor on the diagonal brace to the pole, gouged a streak about 1 in. by 3 in. down the pole, and at the base of the pole it flashed over to the ground rod. The insulators and crossarm were not flashed over, and there was no evidence of burns of any kind on the conductor, arcing horn, or ground rod. The ground rod was bent away from its normal vertical position about 6 in. from the pole in order to examine it closely for burn marks. The gouge is plainly visible, terminating near the top of the ground rod.

In contrast to the usual multiplicity of gouged poles, this one structure only sustained a severe discharge. Three adjacent poles in one direction contained minute slivers down the pole that were hardly discernible, and on all three, the arc had flashed over the diverter gap without damage to insulators or crossarm. In the opposite direction, no marks of any kind were found on the three adjacent structures, but on the fourth structure, containing grounded guys, power-arc burns were definitely visible on both the conductor and the guy hardware of the pole. At this point the total arcing distance from the line to the ground is 6 ft., and it about 2,000 ft. from the point struck.

On the second occasion lightning struck the same line only two spans away from the same guyed structure. In this case the diverter gap flashed over, the pole received a gouge about one in. deep and one in. wide, and no other marks or damage could be found anywhere else. No burns were found on the hardware, and no outage occurred. It seems evident that this second stroke was less severe than the first. Also the footing resistance was somewhat lower in this instance, so that apparently the ground rods effected rapid dissipation of the lightning energy. This in turn reduced the traveling wave potential preventing flashover on adjacent structures as well as reducing the voltage at the guyed structure below the critical flashover of the 6-ft. gap.

Objectives and Estimated Results

The three devices, diverter gaps, ground rods, and insulated guys, in combination, have for their objective the reduction of both outages and damage to wood-pole lines. The general plan applied to existing Bonneville lines is shown in the sketch. They assume that it is preferable to tolerate some minor damage than to involve an outage. They offer no protection for lightning hits to the middle conductor, which can happen occasionally. The limited experience of the Bonneville system indicates that such hits occur on a line of this type about 15 percent of the time and these could be materially reduced by increasing the sag of the middle conductor. Nor do these devices protect for damage from hits to the wood pole or the end of the crossarms, which according to Bonneville experience is about 10 percent of the total, although in a large percentage of these cases the outage should be eliminated.

It is estimated that these devices should reduce the outages and damage to less than 20 percent of those that would otherwise occur on an unprotected line. The cost of this type of protection also is about 20 percent of the ground wire and counterpoise method of protection. Other hazards of ground wires such as those that have been encountered from ice and sleet are also eliminated.

Streamlining Distribution Poles

Transformer pole is streamlined by single case containing two single-phase core and coil transformer units for open delta or open wye service

EARL BAUGHN, The Washington Water Power Co., Spokane*

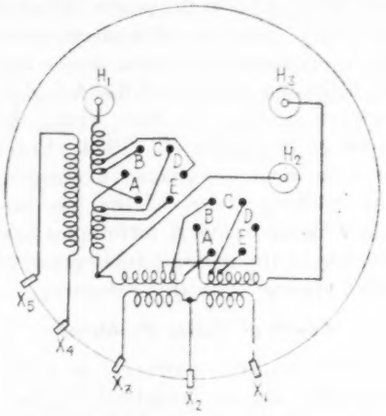
FOR MANY YEARS engineers of the electric service companies have recognized the necessity of making the pole lines located on public streets more pleasing in appearance. One of the most difficult problems has been the mounting, in a manner that is pleasing to the eye, of two or three, single-phase transformers on one pole, in order to supply three-phase service.

* Assistant Electrical Engineer

Since the advent of direct pole-mounted transformers on pole plates, attempts have been made to mount two transformers connected open delta one above the other on the same pole. This has proved to be difficult, however some satisfactory arrangements have been worked out.

The necessity for serving many customers with combined lighting and three-phase power service from a three-phase, four-wire delta secondary circuit, has resulted in the use of many open delta and open wye transformer banks. Usually one transformer is relatively large, for instance a 37½-kva. or a 50-kva. banked with a 5-kva. or a 10-kva.

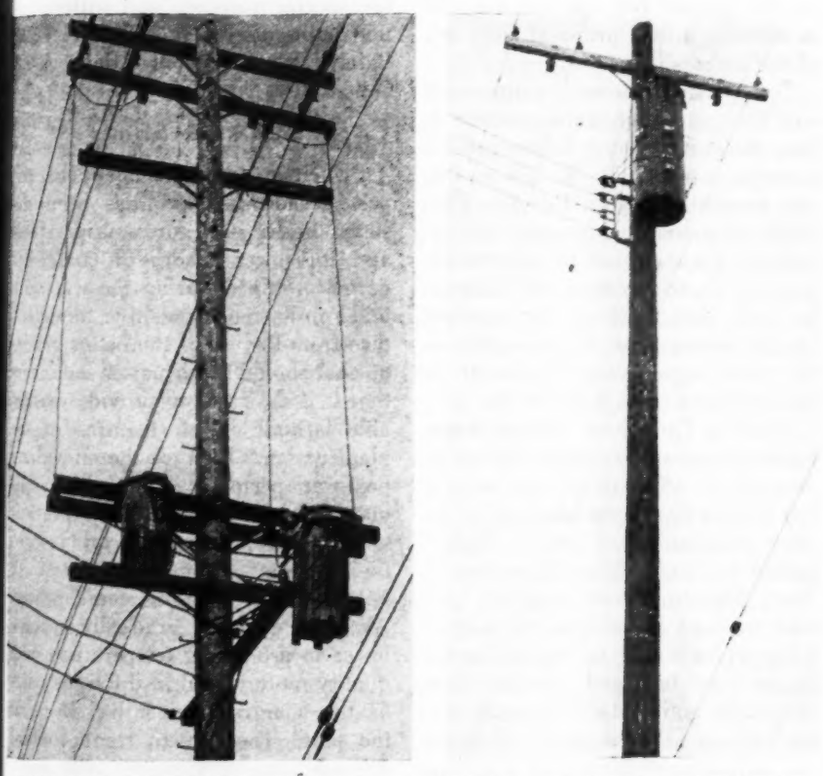
Most transformer manufacturers have developed a three-phase transformer consisting of three standard single-phase transformer core and coil units mounted in one tank. About 3 years ago Lester R. Gamble, of The Washington Water Power Co., discussed with the engineers of various manufacturers the question of developing a three-phase transformer consisting of two core and coil units of dissimilar size and connected open delta or open wye. The development of this idea was delayed by the war, but a trial installation has now been made in Spokane, being placed in service in February of this year.



CONNECTION DIAGRAM for two-unit, three-phase distribution transformer

The transformer, as manufactured by the Line Material Co., consists of two standard distribution transformer core and coil assemblies mounted one above the other in a tall slim tank as illustrated. The ratings vary from 37½-kva. to 5-kva. for the larger unit and from 25-kva. to 5-kva. for the smaller unit. Three high-voltage and five low-voltage terminals are provided so that it is possible to connect the transformer either open delta on 2,400 volt, three-wire or open wye on 4,160 volt, four-wire primary feeders.

The new installation illustrated shows a 2,400—120/240-volt, three-phase transformer consisting of one 25-kva. and one 10-kva. unit mounted in a single case at a location where separate single-phase transformers were formerly used. The improvement in appearance is evident.



IMPROVED APPEARANCE is most striking in this before and after view of distribution transformer pole. Left view shows the "full rigged ship" conventional arrangement of crossarm-mounted transformers of dissimilar size for four-wire, single-phase and three-phase service. Same pole is shown at right after installation of pole-mounted case containing two core and coil units. There is now only one crossarm instead of seven

Power Plans, Fuel Resources Dust Collection Techniques

Problems of expansion of nation's power facilities for post-war demands canvassed in power and fuel division sessions at A.S.M.E. annual meeting—Status of fly-ash collection and of nation's fuel resources also discussed—Gas turbine injected into several forums

ARCHER E. KNOWLTON, Associate Editor, ELECTRICAL WORLD

SIGNIFICANT to the power industry looking to post-war adjustments were topics explored at certain power and fuel division sessions of the A.S.M.E. annual meeting in New York, the week of November 27, 1944. Problems incident to capacity expansion, the evolving status of the gas turbine, fly-ash removal techniques and the life of the nation's fuel resources were uppermost in this category.

Post-War Power Problems

Three utility engineers, a boiler engineer and an industrial engineer constituted the panel which discussed the program of power expansion under the chairmanship of T. E. Purcell (Duquesne Light).

T. G. LeClair of Commonwealth Edison opened by discussing the trend of the nation-wide peaks, mentioning incidentally that reversion to standard time would enhance the peak utility system demands by from 1,000,000 to 1,500,000 kw. Expansion for this war has been some 60 percent against the one-third increase for World War I, showing the higher degree of purchased power. Post-war estimates range from a 15 percent increase for one of four representative companies to another that believes it will take three years to recover to even 94 percent of the present peak.

Man-hour costs seemed to E. B. Ricketts (Consolidated Edison) certain to stay up but he believed the costs per kilowatt hour are reducible. Fuel is likely, too, to stay up but the prospect is for much better uniformity in quality than at present. Approach to the limits of the present steam cycle is sure to give impetus to alternative fuels and cycles. Evolution will not be too rapid, however, and he said it took the mercury cycle 25 years to mature from the days when it was first seriously advocated. As for the gas turbine he thought he "had a good application for one, after reading the recent burst of literature on the subject but was unsuccessful in eliciting a firm proposal from any of the authors".

Betterment of power facilities will call for more penetrating study to keep the cost of power in competitive position, asserted P. W. Thompson, vice-president, Detroit Edison. Each dollar of annual maintenance and operating expense saved by betterments made to electric systems will balance, he said, about $10 of the required capital expenditure; his associates on the panel were inclined, however, to set the figure from $4.50 to $6.

Quoting Thompson, "where maintenance costs are excessive, capital investment to offset them may be safe, but the savings to be effected by the mere substitution of new or higher-priced equipment may be potential. Also, operating costs vary in part with the load and in lean years operating savings due to capital investments may be much smaller than originally anticipated. Expenditures for betterments to improve reliability are particularly difficult to appraise. In the generating station the decision may be more a matter of judgment than the result of experience. In the case of transmission and distribution, however, the records of past outages and failures, may point very definitely to the need for improvement." System load factors, he said, will almost surely be less favorable than they have been during the war.

Major reliance of industry for power production will continue to be placed on steam despite the developments in diesel and gas-turbine units for special purposes and within certain limits of size, according to E. B. Bailey, vice-president, Babcock & Wilcox Co.

Fuel Characteristics

Principal accomplishment of the past decade, he said, has been the steam boiler unit for multiple fuels and for lower grades of coal. Experience gained during the war with other units more sensitive to departure from the use of the better grades of coal should teach power engineers that it is desirable to provide reasonable latitude in all features of the plant design. Fuel for the immediate post-war period will not likely be materially different from the pre-war period, except for a trend toward higher costs. Long-range trend will be toward less oil for steam power. Available coal will gradually become lower in ash-fusing temperature with quality more varied in different parts of the country than it has been in the past. The present trend toward dry-ash-removal furnaces will probably swing toward slag-tap ash removal. Developments in alternative forms of power generation equipment will depend to a considerable degree

upon the relative costs of the fuels required for each of them.

Manufacturers' representatives in turn disclaimed any promise that the gas turbine will immediately pose any threat to the steam turbine in the sizes customarily used by electric utilities. It was asserted that war developments of superchargers and jet motors had given an impetus to the high temperature studies that might otherwise have consumed several years of experimentation.

Gas Turbine, Portables

C. C. Jordan of Allis Chalmers mentioned the 25 units functioning in the Houdry gasoline installations, but said their efficiency was not high enough to claim arrival as a base-load primer mover. He was definitely of the opinion that the gas turbine is feasible now as a peaking tool. To counter this and join hands with Ricketts, Chairman Purcell told of a salesman dashing into his office to ask him if he would buy a 7,500-kw. unit if he could. Purcell answered yes but the salesman exited without further elucidation.

Glenn B. Warren, General Electric, told how the war had given actuality to the long-standing proposal to build small portable power plants, now applied in rail and barge forms. He felt that utilities could give proper consideration to the acquisition of some of them for location at or near industrial plants which need both power and heating steam even if only for fairly temporary situations. C. C. Franck of Westinghouse told of the Soviet program of building power plants and industrial plants in close proximity for better economic coordination of their thermodynamic needs. He suggested this country similarly study the potentialities.

Dust Collection

Status of the art of dust and flyash collection was surveyed in a forum directed by M. D. Engel of Boston Edison with H. E. Macomber of Detroit Edison as recorder. Engel said the A.S.M.E. Power Test Code (No. 21) will deal with the measurement of dust content and degree of dust removal and that he hoped to see thereafter field reports for the sake of their bearing on promotion of improvements in the art.

Principles of functioning were grouped by L. C. Whiton of Pratt-Daniel in five classes embracing the impingement, centrifugal, cyclonic, electrostatic and combination mechanical-electrical types. A pilot plant of the latter variety at Huntley Station in Buffalo had afforded extensive tests and now there is a commercial unit on a 900,000 lb. per hour boiler with the electrostatic element handling 100,000 cu. ft. per minute. Advantage of the combination is manifestly to merge the capability of the mechanical component in extracting all but the fines with the superiority of the electrostatic precipitator for removing those fines.

There is too much tendency to discount the fines of 10 microns and less because of their ability to travel far after leaving a stack, said R. F. O'Mara of Western Precipitation Corp. Wide variations in proportions of particles of various sizes from the smallest to the 43 micron equivalent of 325 mesh make the matter of guarantees of performance a difficult one; it is not a simple matter to find or create a standard composition for test and calibration purposes. He joined Whiton in preference for statement of separate percentage-removal values for each bracket of particle size.

Precipitators and Scrubbers

The Van Tongeren units of Buell Engineering Co. were described by H. C. Dohrmann and he showed how varying space limitations can be met by various dispositions of basic units in parallel. He warned that headroom is often provided insufficiently large to accommodate a self-clearing hopper; adding that operators too often do not appreciate the virtue of emptying the hopper when it is filled. He showed a photo of a battery of units applied to the recovery of catalyst from the process of producing 100-octane gasoline; the temperature is 1,000 deg. F.

The aggregate cleaning duty of the 200 Cottrell precipitators on 220 steam generators is some 34,000,000 cu. ft. of stack gas per min., said C. E. Beaver of Research Corp. He recited the substitution of perforated metal plates for the earlier concreted ones which gave an unfavorable weight for roof installation. Series arrangement has facilitated progressively higher extractions. Units of this type are now deriving most of the carbon black for synthetic rubber admixture. His corporation had often given consideration at various times to combinations of mechanical and electrical units but had not deemed them feasible.

Description of an equipment which puts more focus on the re-utilization of the combustible in flyash from spreader stoker furnaces was read by Macomber for E. W. Bullock of Flyash Arrestor Corp., Birmingham, Ala.

Mention of a type of collector not enumerated by Whiton was made by Allison Craig of Riley Stoker; it is the wet-type on which the particles impinge on wetted carbon blocks and are washed away. One obstacle to efficacious adoption at times is the problem of disposing of the scrubwater. Acids formed in the gases do not affect the carbon; six to seven year life has already been demonstrated. The tank is lined with chemical tile. Removal is 90 percent and maximum pressure drop is one inch. No power is required because of the joint action of pressure drop and expansion. Craig asked why fan manufacturers do not produce blades that resist erosion.

Fuel Resources

Insufficiency of our oil reserves at prospective rates of consumption without recourse to imports was asserted by W. C. Schroeder of the U. S. Bureau of Mines. The "scares" of 1912-15 were dissipated by new geological discoveries which continued at an encouraging rate up to 1938. Since then they have fallen first to one-half and in 1943 to one-quarter the consumption rate and still less this year and manpower shortage is not an adequate explanation. Size of fields found is now about one-tenth those of a decade ago. The Persian Gulf area is the world's largest reserve and appears to equal our present in-the-ground stock of 20 billion barrels, enough to carry us only some 12 or 13 years, he said.

Cost of coal will undoubtedly be above pre-war levels, said R. C. Johnson, vice-president, Anthracite Industries, Inc., and H. C. Rose, vice-president, Bituminous Coal Research, Inc., concurred for his industry adding that wide availability of reserves and increased mechanization will afford a check. Potential yield of the mines has always exceeded the demand; output per worker has gone up 35 percent in 30 years. Nearly 90 percent is now mined mechanically and 50 percent is mechanically loaded.

Plastic Chemistry in the Electrical Field

Progress in organic dielectrics largely based on developments in plastic chemistry—Dielectrics have had desirable properties "built in" through additions to or modifications of the base molecules

W. C. GOGGIN and R. F. BOYER*, The Dow Chemical Co., Midland, Mich.

FUNDAMENTALLY, the electrical industry is interested in two basic types of material: first, good electrical conductors; and, second, good electrical non-conductors or insulators. This article deals entirely with the electrical non-conducting materials. It would be impossible in a short discussion of this nature to follow the detailed chemical developments that have resulted in good electrical insulators. Rather than attempt to do this, we simply wish to point out the trend of thinking that led to the development and its results. This brief treatment does not permit consideration of detailed exceptions that can be pointed out where such generalizations are used.

A good electrical insulator should possess at least the following properties: excellent electrical characteristics, low moisture absorption, non-inflammability, high heat distortion temperatures, strength and toughness, chemical resistance, and permanence. The problem then becomes one of inquiring as to what organic chemical structure can be used to obtain each of these various properties.

Organic chemistry is based on the element, carbon, whose extreme reactability permits the building up of an almost infinite variety of chemical compounds having a wide range of properties. Synthetic organic plastics are characterized, not only by the presence of carbon, but also by the fact that carbon atoms are arranged in long, chain-like molecules whose structures possess strength, toughness, flexibility, and high melting points.

This chain forms the skeleton (Fig. 1) to which various chemical building blocks can be added to modify its basic properties. These additions may make the chain polar or non-polar. Generally, a polar chain has good mechanical properties, while the outstanding characteristics of the non-polar chain are its electrical properties. Characteristics that some of the building elements of Fig. 1 impart to the completed structure are shown in Fig. 2.

In general, carbon and hydrogen lead to good electrical properties and low moisture absorption, but are bad with regard to flammability, heat distortion, solvent resistance, and strength. On the other hand, the polar group leads to good mechanical properties with corresponding sacrifice in electrical properties. Such physical properties as crystallinity and cross-linking can also be employed to achieve some of the desired results. Essentially, though, the problem reduces itself to the choice of a combination of polar and non-polar groups which will give a proper compromise between mechanical and electrical characteristics in the final product.

* Plastics Development Division.

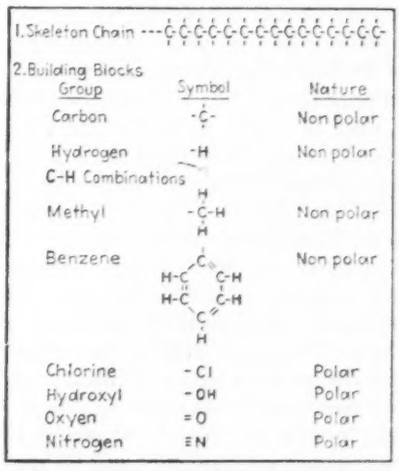


FIG. 1—Some building elements of organic plastics

	Recommended	Not Recommended
Electrical Properties	-H	-Cl -OH ≡N
Low Moisture Absorption	-H Physical Crystallinity	-OH ≡N
Non Flammability	-Cl -Br	-H
High Temperature Operation	-Cl Physical crystallinity Cross linking or vulcanization Long chains	-H Short chains
Strength and Toughness	-Cl OH ≡N Crystalline orientation	-H
Chemical Resistance	Cross linking crystallinity	-H OH

FIG. 2—Characteristics imparted to finished chemical structure by certain building elements

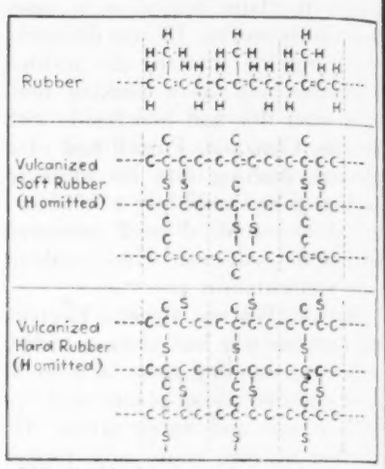


FIG. 3—Mechanics soft and hard vulcanization of the basic rubber polymer. Sulphur is the linking agent

Through tedious trial and error methods, the process of chemical vulcanization of rubber (Fig. 3) was discovered. This immediately made it possible to have a stable insulating material flexible at both relatively high and relatively low temperatures. Improved heat resistance was achieved through vulcanization, or, in terms more generally applied in the plastics field, the cross-linking of long-chain molecules.

A much higher percentage of sulphur was found to give more complete cross-linking and a more rigid, box-like molecular structure, resulting in a hard, rigid material known as ebonite, or hard rubber, which had good electrical properties and which could be fabricated by molding and vulcanization methods.

Wood (basically cellulose) is another organic plastic molecule of somewhat more complicated chemical structure (Fig. 4). In its natural state, it is an insoluble, infusible material containing chemical linkages and chemical impurities which lead to high moisture absorption and generally poor electrical properties.

Cellulose Derivatives

The first important derivative of wood was nitrocellulose, obtained by replacing some of the OH groups on cellulose with nitro groups. The advantage thus gained in solubility and ease of handling, however, was more than offset by a considerable increase in flammability which limited this material's use in the electrical industry.

A more useful derivative was that obtained by reacting wood pulp with acetic anhydride to produce cellulose acetate. Replacement of the OH groups in cellulose with acetate groups reduced moisture absorption, improved the electrical characteristic, and increased the ease of fabrication, while still retaining the desirable mechanical properties of the basic cellulose molecule.

Another interesting development was that which led to ethyl cellulose. Here an even greater decrease in moisture absorption and a more desirable set of electrical properties were obtained. The product has been made soluble so that it can be used in electrical lacquers and solvent cast films. Perhaps most important of all the modifications, these products have been made heat formable, thus lending themselves to high speed, mass production molding methods.

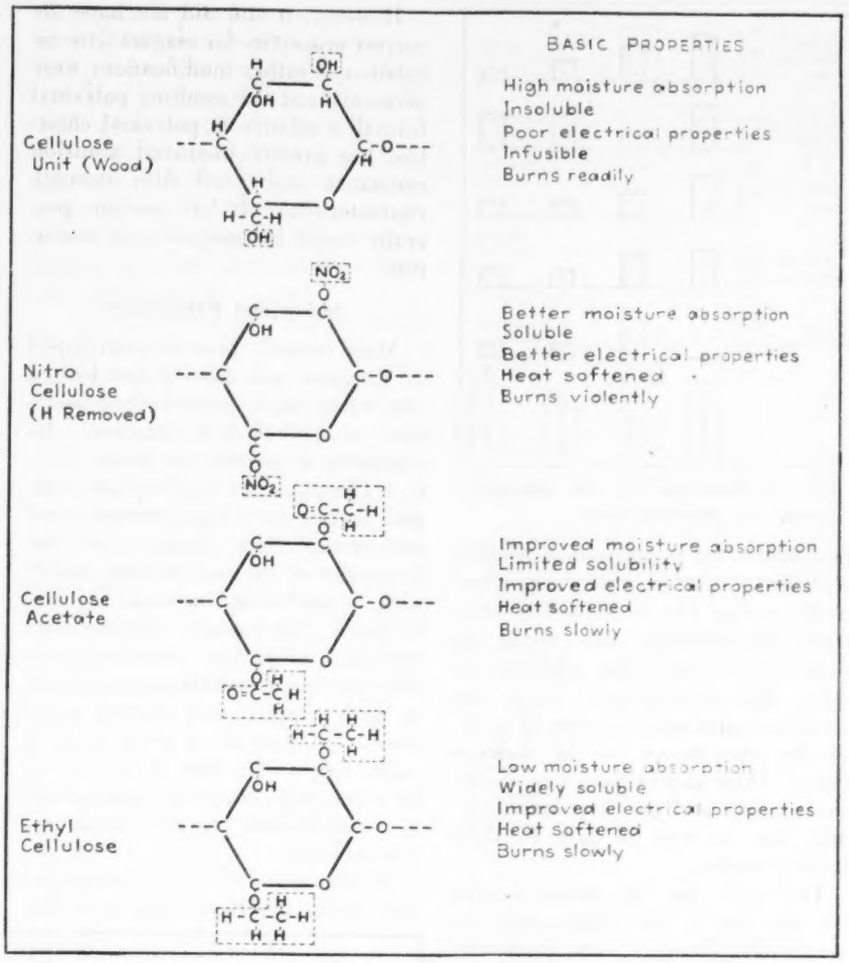


FIG. 4—Evolution of cellulose plastics from wood base. Nitrocellulose came first but its flammability deterred applications in the electrical field

Phenol Formaldehyde

Inorganic insulators, such as slate, glass, mica, etc., have certain shortcomings. Here, again, it became possible for organic chemistry to improve certain of these characteristics. The natural materials listed have one common disadvantage—they are not easily fabricated, and in large production, the fabrication becomes not only time consuming but also expensive. However, it had been discovered that the chemical, phenol, could be reacted with another chemical, formaldehyde, to give the well-known Bakelite thermosetting resin. This reaction permits chemical cross-linking somewhat comparable to the previously mentioned vulcanization of hard rubber.

The product can be compression-molded to the desired insulator shape and handled at relatively low expense on a mass production basis. This very important improvement outweighed the loss in properties in the form of slight flammability, lower heat resistance, and, in some cases, slightly poorer electrical properties. The rigid insulating product obtained was, in general, an improvement in the reduction of brittleness and shatterproofness.

Later developments with phenol formaldehyde made it possible to fill the molding material with mica, slate, and other of these natural products in a finely divided state to regain (Fig. 5) many of the desirable electrical properties lost in making pure phenol formaldehyde. Still further improvements in fabrication methods gave even lower production costs.

Wax

Wax is a good electrical insulator but its mechanical properties, particularly its strength and limited flexibility, as well as its limited heat resistance makes it unsuitable for most applications. Its use was largely

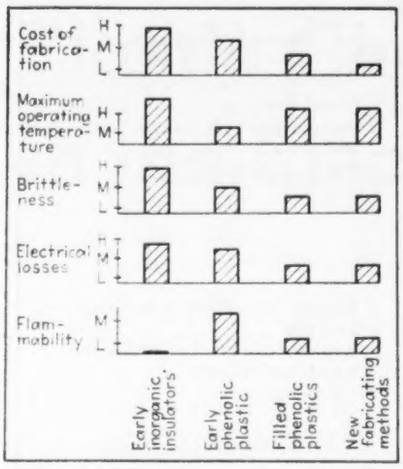


FIG. 5—Properties of the phenolic plastics for electrical uses

relegated to the impregnation of other electrical insulators which were physically strong but perhaps had electrical shortcomings that might be improved through the addition of wax. The paraffin type waxes are straight chain hydrocarbons (Fig. 6) of the type shown by the skeleton chain. These chains have a relatively short length and are poor mechanically, due, at least in part, to their limited length.

For years, the theoretical chemist has felt that if this chain could be greatly lengthened, a new, mechanically strong electrical insulator would be made available. Unfortunately, the chemical processes involved are complicated, and until recent years, this has been practically an impossibility as far as commercial production is concerned.

Polyvinyl Formal, Polyethylene

It is possible, however, through somewhat roundabout methods to produce a product simulating the paraffin wax molecule, but containing one chlorine atom per two basic carbon atoms in the molecule (Fig. 6). This product is known as polyvinyl chloride, more familiarly in this country in its modified forms as Koroseal, Flamenol, etc. This is an improvement over the waxes in that its flammability is greatly reduced or eliminated, and its mechanical strength is markedly improved but somewhat at the sacrifice of its electrical properties. Its heat resistance and general fabricatibility are such that it can be extruded over wire to give a good oil and grease resistant, fireproof insulation. Such cable has been widely used on shipboard.

However, it still did not have the correct properties for magnet wire insulation. Further modifications were necessary and the resulting polyvinyl formal, a relative to polyvinyl chloride, has greatly improved abrasion resistance and good film strength characteristics. It has become generally useful for magnet wire insulation.

Amber and Polystyrene

More recently processes developed in England and now in the United States have made possible the production of polymerized ethylene. Its similarity to paraffin is shown (Fig. 6). The processes involved are complex in that very high pressures and temperatures are needed, but the properties of the end product justify such a production method. As anticipated, polymerized ethylene has electrical properties comparable to wax and has a material improvement in its mechanical and thermal properties. Its lower losses are so good at radio frequencies that it appears to have one of its important applications in semi-flexible, high frequency, coaxial cables.

Another natural organic plastic occurs along the Baltic Sea as a fossilized, resinous deposit known as amber. Its exceptionally high volume resistivity early recommended it for use on electroscopes and other similar instruments. However, it was variable in quality and somewhat limited in available sizes.

Another natural material of similarly excellent electrical properties was once isolated from a balsam of an Asiatic tree. It is a low molecular weight material suitable for lacquer formulations but of no value as a structural material. Its modern counterpart, which is a product of the organic chemical industry, is known as polystyrene or by such trade names as Styron, Lustron, and Loalin. This material is characterized by exceptional dielectric properties, low moisture absorption, good dimensional stability, and high optical clarity. However, its heat distortion temperature of 82 deg. C, has limited its usefulness in many electrical applications, while its low elongation prohibits its use in certain fields requiring high impact strength. As a pure hydrocarbon material, it is, of course, flammable.

Introduction of chlorine into the polystyrene molecule serves to reduce flammability. This chlorine may be

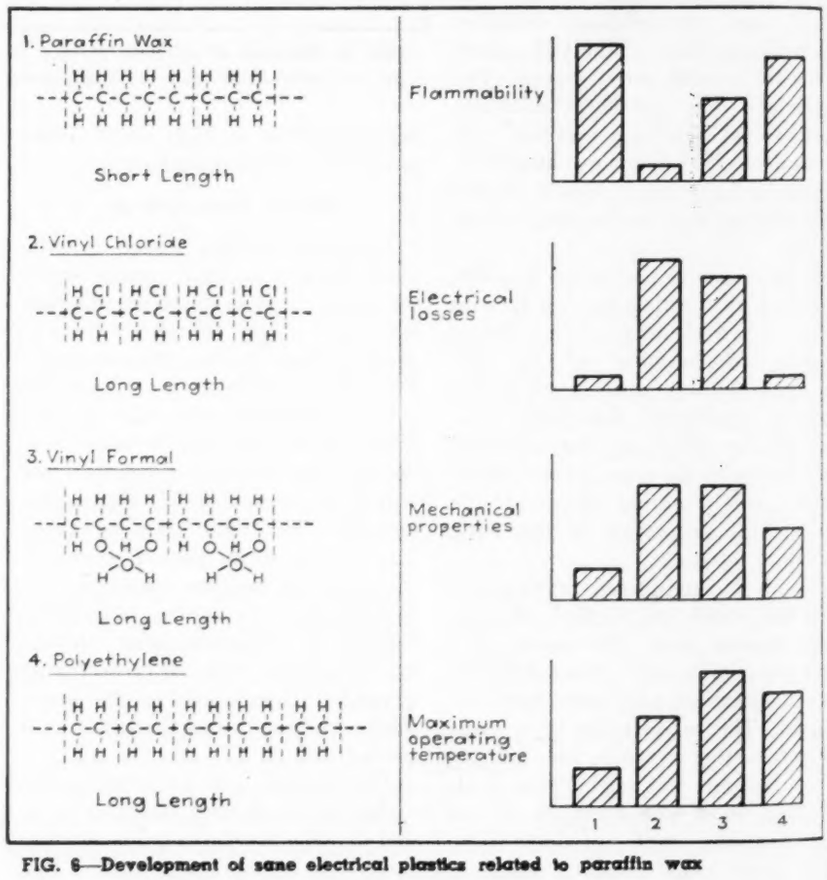


FIG. 6—Development of some electrical plastics related to paraffin wax

added as a separate compound, namely, chlorinated diphenyl which forms a product known as Styramic. An improvement in heat distortion temperature results from this same formulation. Alternately, the chlorine may be chemically combined with the styrene molecule.

The heat distortion temperature can also be materially improved (Fig. 7) through the introduction of chemical cross-linkages. These links may consist of carbon atoms which allow the excellent electrical properties to be retained. While polystyrene has long been used as high frequency insulation, the advent of its more heat resistant, modified forms will increase its utility many fold.

Fibers, Nylon, Saran

Another important class of organic insulator materials includes the natural fibers, cotton and silk which can be used for braided tapes, twisted wire insulation, woven cloth, etc. They have shortcomings such as flammability, sensitivity to moisture, limited operating temperatures, and relatively poor electrical properties.

The chemist has also been busy in this field. Here the molecule has been designed to simulate essentially the actual natural molecule. In this way Nylon, as a base material for a fiber, was developed.

Nylon has certain advantages that recommend it over natural fibers in the electrical insulating field. It has improved strength and higher permissible operating temperatures. Its water absorption is limited, and its electrical properties are quite good.

Saran is a fiber development which overcomes the defect of flammability. In Saran, the moisture absorption is very greatly reduced. Mechanically, it is strong, and chemically, it is extremely inert (Fig. 8). Actually, plastics of the Yulon and Saran type differ from most of those previously mentioned in that they are very highly crystalline, in fact, formed of crystalline bundles. Very great improvements in mechanical properties through the physical process of orientation, or stretching, can be obtained when a basically crystalline product is subjected to several hundred percent elongation. Thus, in order to take full advantage of the properties available in these materials, it was necessary to devise a method of stretching, or orienting, both of these crystalline products. This stretching results in crystalline alignment, making tensile strength increases of tenfold the natural tensile strength not out of the ordinary. While nylon, and particularly Saran, are relatively new to the electrical industry, it is probable that more extensive use will be made of both of them in the form of fibers and in thin, tough films.

The discussion presented here is far from complete with regard to both the many types of plastics available and the many interesting details involved. The judicious use of various chemical-building blocks at the chemist's disposal has meant the balancing of polar and non-polar groups, the application of vulcanization, cross-linking, crystallinity. With carefully selected combinations, it has been posible to improve many of the desired properties. In some cases, it has been necessary to achieve a compromise between electrical, mechanical, thermal, and chemical properties in the final plastic.

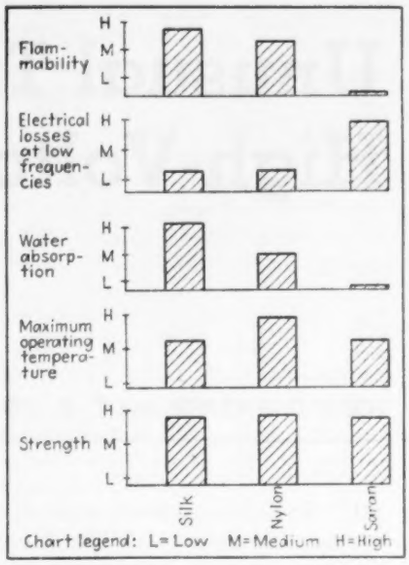


FIG. 8—Relative properties of silk, nylon and Saran

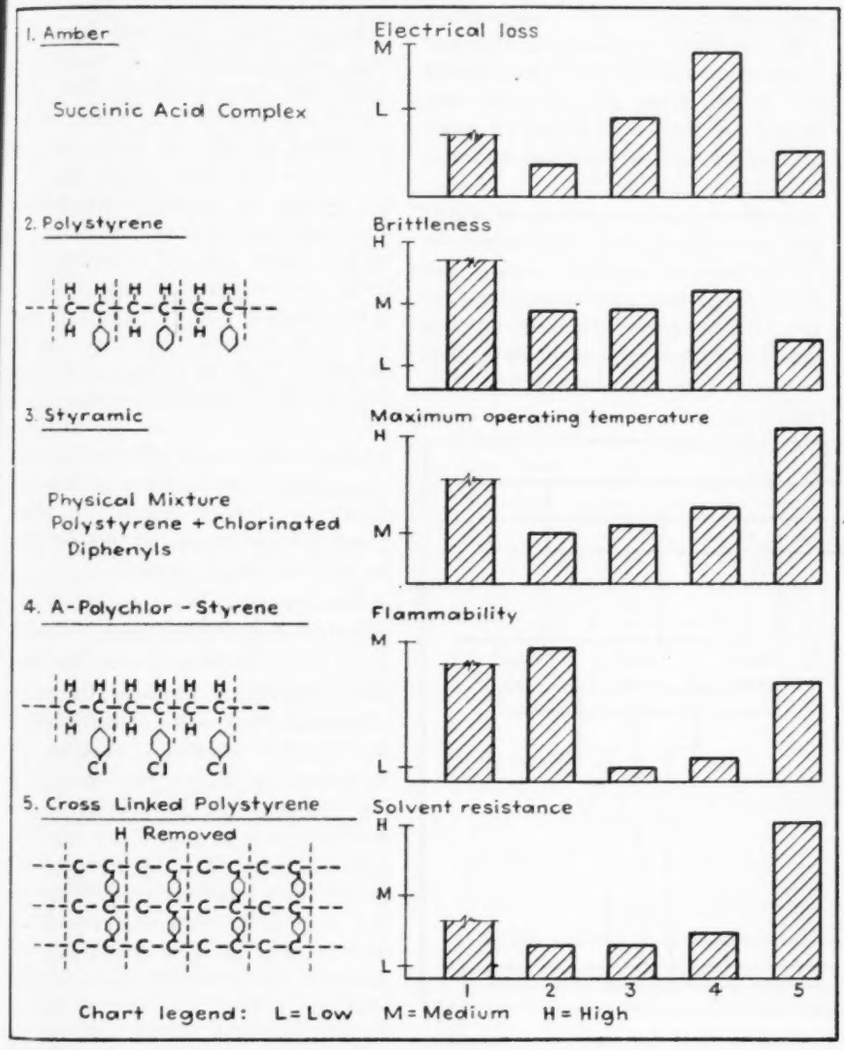


FIG. 7—Electrical plastics of the styrene family

Unusual Troubles with High-Voltage Transformers

Methods for detecting and averting loose-stud nuts, resonant voltages, open metering circuits and tap-change leads, gasket leaks, shorted coils and opened leads are covered in detail

JOHN D. HARPER and E. H. COXE, JR., Aluminum Co. of America, Alcoa, Tenn.

THIS PAPER describes a number of unique transformer troubles occurring over a period of years on a large power system in the South.

A bank of three 14,000-kva. transformers, connected 150-kv. wye to 13.2-kv. delta, was operating in paralliel with other transformers, of the same rating when the meter showed the bank had dropped a portion of its load. No breakers opened. The load was picked up by the other banks feeding the same bus, with no sign of disturbance. Visual inspection showed no sign of distress. The bank was energized from the low tension side through its secondary oil circuit breaker. When this was done the middle transformer had no 60-cycle hum. The oil of this transformer tank was lowered and the transformer inspected internally. It was observed that the winding lead to a secondary bushing had burned open. The terminal had been soldered to the coil end and fastened to the bushing stud with only a single nut. This nut had vibrated loose, creating a high resistance connection which had melted the solder from the terminal and started an arc. This arc burned away a large part of the terminal and was extinguished by the oil.

A phos-copper welded terminal was put on the coil end and bolted securely to the bushing stud. The transformer has been in service thus for over a year. Melted solder was fished from among the coil ends. This is a shell-type transformer and it is improbable that all solder was found. A failure from this source, therefore, is not unexpected. The twenty-year age of this transformer made the job of unstacking the iron for removing this solder appear impracticable.

* Assistant District Power Manager and Electrical Engineer, respectively; adaptation of paper at recent conference of clients of Doble Engineering Co.

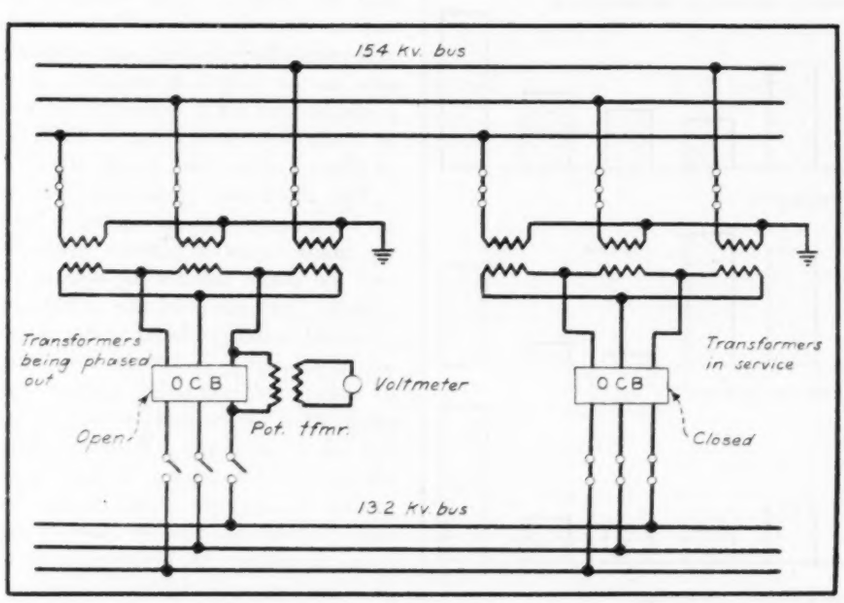


FIG. 1—Connections used in phasing out transformer bank preparatory to parallel operation. Potential transformer is connected across the 13.2-kv. breaker

Resonant Voltages During Phasing

A new 154-kv. bus and disconnecting switch, feeding a 42,000-kva bank, had been installed. The bank was being phased out before being paralleled at 13.2-kv. with the bus which it was to feed. Since the 13.2-kv. system was ungrounded and the incoming transformers were delta connected, there was no common electrical connection between the units being phased out. Previous experience had indicated that this was not essential. With the voltage and capacities involved the electrostatic capacity to ground creates an artificial neutral, which is in effect a common connection. The presence of this condition is checked easily by cross-phase voltage measurements between the sources being phased.

The phasing was done with a potential transformer and voltmeter (Fig. 1). Because it was the simplest physical arrangement, the potential transformer was connected across the 13.2-kv. secondary breaker and energized by closing the disconnecting switches to the 154-kv. transformer primary and those isolating the breaker across which the potential transformer was connected. When the last of these switches was closed, two transformers of the bank blew their pressure relief diaphragms with a loud explosion. The bus protection isolated the fault, which was limited to the inside of the transformers.

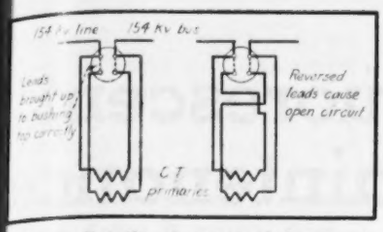


FIG. 3—Details of reversed leads of the current transformers which caused the transformer arc

There was no sign of trouble at the potential transformer nor at the disconnecting switch which initiated the fireworks.

Internal inspection and testing of the transformers revealed flashovers between 13.2-kv. secondary bushing terminals or from each to ground below the oil level. Neither the bushings nor the winding was damaged. After filtering the oil and cleaning away the carbon deposits left by the fire, the transformers showed proper ratios and good Megger and Doble tests. The transformers were then phased out, this time with one 13.2-kv. phase closed for a common connection, and put in service. Why the flashover occurred where it did, instead of outside the transformer where the air presumably would have a lower breakdown than the oil, is not known. The bushings were not equipped with air gaps. The trouble has been analyzed as due to incidental resonant relationship between power transformer capacitance to ground and test transformer reactance, which caused an abnormally high voltage.

Open Metering Circuit

Two power systems are paralleled at 154 kv. through two breakers, each of which has in series with it a set of one-bushing combination current-potential metering transformers (Fig. 2). No. 1 set had been in service for some time and had ammeters in its breaker bushing-transformer secondary circuits. No. 2 set had been put in service, temporarily without ammeters. When the breaker at No. 2 position was first closed, the middle phase ammeter of No. 1 position showed twice as much current as the other phases. This was thought to be due to meter or bushing transformer secondary trouble. Arrangements were made to clear No. 1 metering transformers and breaker to locate this trouble. When the breaker was opened, a heavy arc appeared at the top of the bushing of the middle phase of No. 2 position metering transformers. The station operator immediately called the load dispatcher who had the No. 1 position breaker closed again and the No. 2 position breaker opened. This extinguished the arc.

Investigation revealed that leads had been incorrectly brought up to the terminal cap in the No. 2 position middle phase transformer bushing (Fig. 3). This left an open circuit which carried no current. While No. 1 metering position breaker was closed, the voltage across this open circuit was negligible, being only that due to drop in the buses between the two positions. When No. 1 position breaker was opened, the middle phase was left completely open due to the omitted jumper at the No. 2 position. The 89 kv. which then appeared across this open circuit exceeded its dielectric strength and the arc was initiated. The amazing feature of this episode is that this arc carried one phase of a 160,000-kva. load while two telephone calls were made, and no interruption to service occurred.

Tap-Changer Leads

A 14,000-kva., 161/13.2-kv., transformer bank relayed out during a lightning storm. No external signs of distress could be found. The transformers showed good Doble, Megger, continuity and ratio tests. The explosion vent diaphragms were not broken. The bank was energized from the low tension side and again relayed out. At this time it was being watched carefully, and one transformer was seen to shake violently. The oil was lowered, and an internal inspection revealed that an arc had occurred between two leads going to the tap changer, burning one of them in two. The one which had burned in two was connected to an unused tap changer position and did not show as an open circuit when the ratio and continuity tests were made. It would have been found had all tap changer positions been tested instead of only the one in use. The voltage used for the ratio test was not high enough to cause the defective leads to break down the oil which flowed between them, but the normal voltage broke down this gap and shorted out part of the high tension winding.

Bad Transformer Gaskets

A 4,000-kva., 13.2/440-volt, three-phase transformer was removed from service due to high power factor of insulation. This condition was discovered by a routine test. The oil tested above 25 kv. while the transformer was in place, but less than 15 kv. after the transformer was moved to the shop for untanking. Internal inspection showed the tank to have nearly an inch of water in the bottom. The sampling and filtering valve entered the tank on the side, an inch above the bottom. While standing still, the water settled out of the oil and

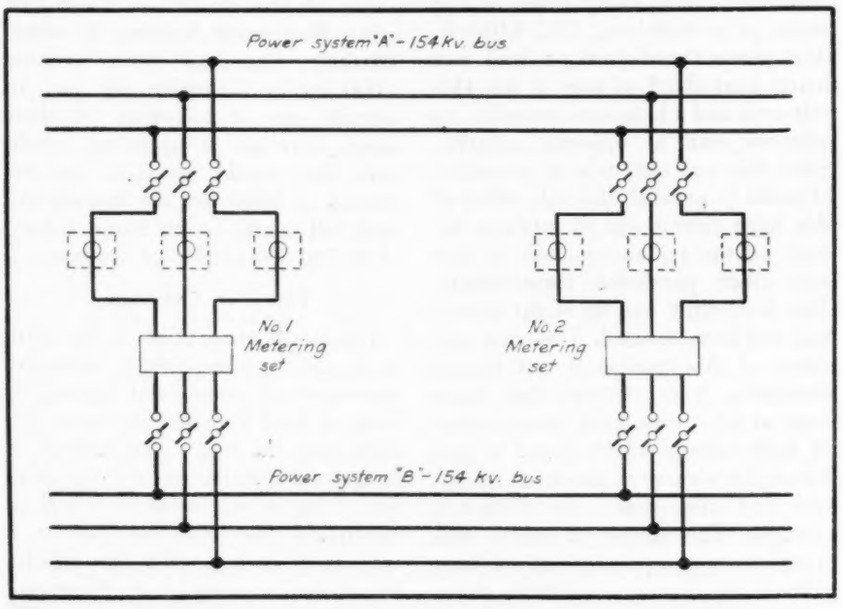


FIG. 2—Incorrect connection of metering leads created an open circuit which started in internal arc. Details of these connections shown in Fig. 3

permitted good tests. Moving the transformer agitated the oil, and tests revealed the presence of water. It had entered the transformer through deteriorated gaskets on the cover and had permeated the coils on the way to the bottom, thereby increasing the power factor of the insulation. A new valve was installed in the bottom of the tank.

Shorted Transformer Coil

One of three single-phase, 15,000-kva., 161/3.2-kv. star-delta transformers developed a shorted coil in the high tension winding about one year after installation. The cause was apparently moisture entrapped in the coil during manufacture. The transformer was carrying 80 percent of rating at the time of failure. The operator noticed that one of the three ammeters on the generator connected to the transformer bank was reading well below the other two. The explosion vent was found ruptured on the transformer in question. Physical inspection of the core indicated the location of the damaged coil. This failure was unusual because the damaged coil had burned open and rewelded itself to change the ratio of the transformer without interruption. The rewelded connection had low resistance. There was no unusual temperature rise associated with carrying load for some time after the actual failure.

Transformer Open Lead

In the course of a routine internal inspection, made every three to five years, of a 4000-kva., 13.2/440-volt, three-phase transformer, a lead was found burned off of one of the 440-volt coils and a hole was burned in an adjacent lead of opposite polarity. Since this was only one of a number of paths in parallel, the only effect of this open circuit was to increase the load on the remaining coils in this and other paralleled transformers. This load shift was so slight that it had not been noticed. The time and cause of this trouble is not known definitely. It is obvious that there must at some time have been a surge of high voltage which found a spot where the clearance space or insulation had abnormally low dielectric strength. The circuit of which this transformer is a part had at one time relayed out during a lightning storm and it is probable that the burning occurred then.

Contract Fluorescent Lighting Maintenance

Utilities will help their customers to get better lighting and themselves to get full revenue by encouraging local contractors in the business of fluorescent lamp maintenance

DON G. MITCHELL, Vice-President, Sylvania Electric Products, Inc.

NEARLY TEN PERCENT of fluorescent lamps installed in commercial premises are continuously inoperative. That is to say, utilities are selling only 90 percent of the kilowatt-hours that would be sold for fluorescent lighting in Main Street stores and shops if all tubes were kept in operating condition. This is not an unsupported statement. It rests on the results of a recent survey made in an Eastern area.

How much lost revenue is represented by this ten percent reduction in energy sold for commercial fluorescent lighting is difficult to estimate accurately, but it is certainly some millions of dollars. Let's make a guess. A fair estimate of stores now using fluorescent lighting is about 420,000. Say these stores average 3,000 kw.-hr. annually and pay an average rate of 2.7 cents. If their lamps were all in operating condition, they would use 3,333 kw.-hr. instead of 3,000 and the average annual bill would be $9 more, a total of $3,780,000 additional revenue.

Post-War Condition

Practically every utility in the country is making plans now for intensive promotion of commercial lighting as soon as load building becomes possible after the war. The number of fluorescent installations and the number of lamps per installation will be multiplied two or three times in a very short period. Will the utilities be satisfied to accept only 90 percent of the revenue to which this additional load entitles them? Not if they can help it. And they can.

The way they can help to assure themselves of full revenue from commercial fluorescent lighting is by promotion and encouragement of contract maintenance of fluorescent installations. This is not a new and novel idea. It has grown logically out of the business of maintenance of electric signs. One large sign maintenance company in an Eastern city started developing fluorescent lamp maintenance business in the early spring of this year. It now has over 300 two-year contracts with medium size stores with an average monthly billing of $10 per contract. The contracted service provides for replacement of blackened or burned-out lamps and of ballasts, sockets and starters when needed, for complete maintenance of fixtures and electrical parts in first class operating condition. This is the kind of business the utilities can encourage in the cities and towns they serve, thus helping local contractors as well as themselves.

Those contractors already in the business—there are a few scattered over the country—find that there is a genuine need for the service, that it can be readily sold on a profitable basis, and that subscribers are enthusiastic about it because it gives them the full benefits of their lighting installation.

For instance, here is the Lighting Engineers Co., of Norfolk, Virginia, who started in the business of fluorescent maintenance in 1942. The company now employs 13 mechanics, 2

pervisors, 2 clerks and a foreman, d uses 10 trucks and 3 passenger s in the work. The payroll is 500 per week. This business grew m 3 people and 1 truck in 1941 en it was established for sign serv-. Lamps and starters are changed d fixtures cleaned on set schedules. llasts and other parts are replaced d maintained on a labor and mate-l basis. The close contact with intenance accounts has resulted in development of very profitable neral contracting, fixture sales and on sign service departments. Aver-e maintenance client has 10 four-mp units, the smallest 3 and the rgest 50. And the company has not st a single maintenance customer in o years.

The consensus among contractors ready selling fluorescent lighting intenance service also clearly indi-tes that the best time to get started this new business is right now. hey feel that competition after the ar, due to the return of many small ontractors from war work and the rmed services may tend to increase e number of people who offer the rvice. Experience to date also in-icates that contractors now firmly es-blished in business are best quali-ed to operate a fluorescent lighting intenance service in a manner that best for all concerned.

Contractors Want Facts

Contractors who have not yet es-tablished themselves in the fluorescent lighting business are interested in sim-le, direct plans in terms of their own businesses. They are interested in he actual experience of other con-tractors more than they are interested in abstract planning. They want to know how to approximate charges and profits. They want to know how much they will have to expand their personnel and their equipment. But, above all, they want to draw up a good contract that will protect their investment in men and materials, one that will be as simple and practical as possible and readily understood and purchased by their customers and prospects.

The experience of an electrical contractor operating a fluorescent lighting maintenance service in a medium sized city provides a good example of how easy it is to get busi-ness. After determining the scope of his maintenance service and prepar-ing a good presentation for a two-year contract, he made a mailing to 1,760 known commercial users in his territory. Within a week he sold slightly more than $1,360 worth of two-year contract service, almost wholly from one direct-mail solicita-tion. Commercial users were quick to realize the value of regular main-tenance service. All that was neces-sary to get their business was a good announcement of the availability of a sound plan.

Complete Maintenance

Contractors now doing business usually have the respect of regular customers and are unusually well fitted to perform specialized lighting service. Offering to do the work on a contract basis, in which all services and charges are stipulated, takes lighting maintenance out of the hit-or-miss class and provides the users with insurance against avoidable lighting conditions in which he loses production or sales.

In general there are two classes of contract now being offered by elec-trical contractors. One of these might be called a *partial* maintenance plan. In it the contractor agrees to repair fixtures and replace lamps whenever he is notified of the need by the customer. The contractor does not agree to clean fixtures nor does he agree to make regular maintenance calls. Charges for this sort of serv-ice are based on a unit price usually ranging between 16 and 20 cents monthly for each lamp in the installa-tion. The total monthly billing is rendered in advance and is deter-mined by the total number of lamps in fixtures and the price per lamp. There is no other charge.

Partial maintenance service is a forward step toward maintaining full lighting load in many commercial lighting installations but it does not assure the virtual elimination of lamp outages unless the contractor volun-tarily makes regular group replace-ments of both lamps and starters before they may be expected to fail in service. This type of service also does not give the user an opportunity to enjoy the benefit of increased amounts of useful light which results from regular cleaning of reflectors and diffusing mediums, unless, of course, this is being done by some other agency.

The second class of contract now in use by contractors covers *complete* fluorescent lighting maintenance serv-ice. In it the contractor agrees to make regular service calls for the replacement of lamps and starters and for regular inspection of all elec-trical parts of the fixture. In addi-tion he agrees to clean fixtures on a regular schedule. Charges for this service are based on the list prices of lamps and starters and an established cleaning charge for different types of fixtures. Other charges including those for maintaining wiring, bal-lasts and other parts of the fixture are made on a cost-plus-labor basis. Predictable maintenance charges are pro-rated monthly and billed in ad-vance.

Complete fluorescent lighting main-tenance service assures maximum lighting loads and practically guaran-tees the elimination of lamp outages. Since the contractor is obligated to keep all fluorescent fixtures *continu-ously* in optimum operating condi-tion, and, is fully compensated for service rendered, he will usually ap-proximate lamp life and make group replacements of lamps and starters after they have given rated useful life but before actual failure. This is now practical since fluorescent life has been greatly extended in recent years, particularly when lamps are burned continuously for periods of twelve hours or more and predictable life is extended to 6,000 hours.

Better Utilization

Fixture cleaning actually can be a boon to the utility, because it con-tributes appreciably to the greater utilization of light and therefore stimulates the use of lighting and consequently tends to increase the lighting load.

There are direct benefits for utili-ties who encourage the establishment of sound fluorescent lighting main-tenance services within the com-munities they serve. These services are rendered best by electrical con-tractors who now need a contract formula covering a period of several years and including, wherever pos-sible, a complete plan of fluorescent lighting maintenance. By cooperat-ing with qualified contractors to these ends utilities throughout the country can increase their present lighting loads and assure themselves of a full share of the larger lighting loads of the future.

Editorials

S. B. WILLIAMS, *Editor*

Can Utilities Merchandise at a Profit?

THERE IS A widespread belief among some utility executives that "you can't make money in the merchandising business". As proof they offer assorted red net figures as their merchandising "profit" for one or more years when the gross was a handsome number often in five or six digits.

But let's look further. What happened to that nice gross figure? Maybe the costs that turned it red will not all disappear with departure from a merchandising operation. How much rent, light, heat and other overhead expense of operating branch or district offices and stores has been charged to merchandising? How much more will have to be charged to general expense if merchandising stops? How was advertising cost allocated? How much was charged to merchandising? No utility will stop advertising if it stops merchandising. How much more of this cost will be charged to other accounts than merchandising? Will company appliance repair service be discontinued? If not how will the cost be allocated? How was it allocated before? To merchandising? Will home service be continued?

A good big portion of these costs formerly charged at least in part to merchandising accounts will go on when merchandising stops. They represent part of the pattern of service the American public has come to expect of its utilities. The cost is going to have to be met somewhere else in the accounting structure. And it is going to be there every year.

Now what may companies expect to get in return for this money? Is it going to buy aggressive selling, if merchandising is stopped? Will it buy selective selling, carefully supervised? Will the electric range story be told intelligently in its relation to its gas competitor? Let's think it over and before we accept the statement that "you can't make money in the merchandising business", let's get the facts. Let's look at the allocation of costs between the black gross figure and the red net, how many and how much will remain after merchandis is stopped. And finally let's see what we are getting that money—it will have to be spent anyhow—in te of controlled, carefully-supervised load building. T we will know at least part of the answer!

Coordinating Rural Extensions through Mass Production

ONE OF THE more remote fields for the use of m production methods would appear to be rural line ex sions from present utility systems; but the picture chan decidedly when viewed from the standpoint of commun development. The advantages of applying the meth of system planning on a town-by-town basis in build such lines need little elaboration. Standards of constr tion, where available, are as useful here as in piece-m development; but best of all, the allocation of labor a economic quantities of material procured in adva should result in minimum cost and maximum speed installation. This is true regardless of whether the w is farmed out on contract or not.

Such a program has been announced by Connecti Light & Power which plans to extend a number of ru lines on its system on a coordinated town-by-town ba when materials and labor become available. Since t longer and shorter extensions may be averaged in a giv area in relation to the number of farm customers tak on, a better community coverage should be expect than where individual scattered construction jobs a handled, each of which may be rigidly limited to m specified requirements.

Programs of this type, of course, call for thorou preliminary surveys of service acceptance, load prospe and local engineering conditions; but they deserve co sideration in post-war or earlier planning by utiliti facing the growing demand for farm electrification outlying areas. Finally, the public relations value of t speed that comes from mass production methods important and significant.

Frequency Standards

VARIOUS METHODS have been devised for determi ing the degree of accuracy of frequency meters a recorders but it can hardly be said of any that they a as certain and direct as, for example, the verification volt, ampere and watt indicators. Nor is it necessar that they should be as precise but it would help if th could be as direct and as susceptible of field applicatio Under present conditions it is not uncommon for a pa of system operators to spend an hour or two trying t

gree on what their joint frequency is—if it would only ay absolutely steady they might check in a minute or wo but frequency is always fluctuating with slight fluctuations in load.

Conversely load, in the form of tie-line transfer, fluctuates with frequency tendency. It has been said that a rough relationship is a one percent change with a one-tenth cycle change from 60 cycles. That, to a tie-line administrator is not serious because he can always average out to the day's commitments by setting low to compensate for high periods.

That does not, however, leave the generating station operator—particularly in the boiler room—as well considered as could be desired. Every fluctuation of output means a change of automatic adjustments of fuel, air, water, draft and what not. Even when those base quantities are accommodated properly to the new load there is a new regime of temperatures set up in the boiler and furnace and those changes are conducive to strains as well as to differences in soot and slag deposits. All that is tied in with governor sensitivity but fundamentally it is a question of knowing what the frequency really is (or wants to be) with considerable precision. Some system and plant losses could be reduced if there were more of the more refined frequency indicators and more practicable ways of checking them where they are.

The All-Electric Rate as a Key to the Residential Goal

UTILITIES have promoted and merchandised electric ranges, water heaters, refrigerators and all the other many load-building appliances, but in their zeal to put an attractive price tag on appliances to stimulate volume sales have they given enough consideration to one of the greatest possibilities of all—that of merchandising the electric rate itself? If a "$4.98" price tag on an electrical appliance makes the customer think it is a good buy and that he is getting a bargain, may it not be worth while to apply the same merchandising psychology to the customer's bill? If the customer is given a bargain in rates along with a bargain on the load-building appliances, certainly a step forward will have been taken in attaining the all-electric home.

The idea is not new. In Seattle, where an all-electric rate is used, results over a period of several years have been quite startling. There are now 17,000 customers on an all-electric $5 minimum rate, with an average annual consumption of 7,700 kw.-hr. and an annual average bill of $80.16.

How small the goal of double-the-present-thousand-kilowatt-hour-residential-customer-average in five years seems by comparison. The average bill for this large usage will seem small, but for the past ten years the incremental revenue from incremental residential energy has been approximately 1¼ cents. In fact, for several years it was under 1 cent.

Is it possible that an all-electric minimum rate can be figured on the basis of a 1-cent incremental? What would it bring for a 5,000-kw.-hr. use? Is the figure economically possible? What would it mean in improved living, in improved dealer sales, in wiring, in system expansion—and in labor of many kinds?

It will take courage to put it into effect, but we believe the idea will get some converts who have vision.

Service Responsibility

WHERE DOES IT BEGIN, where does it end, this responsibility for electric service? Does the utility's responsibility begin with the production of electricity and end with its delivery on the premises of the customer?

The lamp in the socket, the flatiron at the end of the cord, the motor in the factory, the water heater in the barn, all the many devices and appliances of electricity utilization—they and the wiring that connects them to the utility's lines are as much essential elements in the electric system as are the generators in the power plant. One might even term them more essential because without them there would be no need for the generators.

The service electricity performs for him, the work it does, is what the customer buys. He pays the utility a bill for service every month. Yes, it says on the bill, so many kilowatt-hours of electricity at so much per kilowatt-hour, but what he really bought was light and heat and work. And if he does not get, or thinks he does not get, as much or as good light and heat and work as he pays for, or does not get them when he wants or needs them, whose is the responsibility?

The customer owns the lamps, the motors, the heating devices and the wiring on his premises. He bought them from somebody other than the utility and of course the utility has no responsibility for them. Or has it?

The customer did not buy the lamps as lamps, the motors as motors, the heaters as heaters. By themselves they are of no use to him at all. He bought them only as means for using what the utility has to sell. It seems as though the utility must admit responsibility for more than adequate supply of kilowatt-hours if it wants the customer to keep on buying them.

Keeping the electricity system working is the utility's job. Only by doing so can it keep revenue coming in, can it stay in business. And, as said, the system includes the customer's wiring and equipment as well as the power plants and lines. Therefore the utility does have responsibility for electric service beyond just the supply of kilowatt-hours. The nature of that extended responsibility is diverse, but the responsibility is real.

WASHINGTON COMMENT

By R. N. LARKIN, Washington Correspondent

Federal Power Policy Taking Form

WHETHER OR NOT the Flood Control Bill, which has been labored painfully through the Senate in recent weeks, becomes law this year or next, the debate and votes on some of the amendments will doubtless have considerable effect upon federal power policy. The effect can hardly be beneficial to private ownership.

Defeat of the Bailey amendment, particularly after the speech by its sponsor, who said properly regulated electric utilities are public assets—a point of view which has been somewhat submerged during recent years—will bolster public power, even though public power had been having its own way in Congress and in the executive departments. The Bailey amendment and speech posed the issue, which had been going by default for years.

Party Lines Fail

Many times in recent years public power projects have been voted upon without the specific issue of public versus private ownership arising as such. Senator Bailey raised it, defended it with considerable skill through long debate and brought it to a vote with its essential philosophy undamaged under the attack of the administration's heaviest senatorial artillery. The vote 42-27, was decisively for public power. Considerably closer election victories have been construed by the New Deal as mandates of the people. Public power didn't need its victory over the Bailey amendment, but, having won it, will be strengthened.

The Bailey vote demonstrated, furthermore, that party lines don't stand up on the power issue. If the Republican Party be an adjunct of the alleged power trust, it fell down on the Bailey amendment, for it mustered only 14 of the votes for it, while 13 G.O.P. votes went against the amendment. This is one reason why its unnecessary victory will strengthen public power.

More important on future federal power policy was the subsequent approval of an amendment establishing Interior Secretary Harold L. Ickes as the marketer of the energy generated at dams authorized in the Flood Control Bill. There is nothing new about placing power marketing authority in the Interior Department, for all federal power except TVA's output and that of a small, decrepit plant at the Soo which the Army sells, is already there. But some of it was delegated years ago before the existing ascendency of public ownership. Much of it came through the operations of the Bureau of Reclamation, which is in the Interior Department anyway, and some of it came by executive order. If the House goes along with the Senate, the existing policy will be strengthened indeed, by the inclusion in Interior's domain of projects all over the country, not just in the West. The amendment stands to gather up any loose ends in the policy and knot them securely, and is a logical enough move. One of the fears expressed by Senator Bailey was of a divergent application of federal authority over power in different sections of the country. Putting all the power marketing not performed by a regional authority under one agency should mean uniformity of policy.

Interior Control

As regards the exception, the marketing of its own power by TVA, Mr. Ickes apparently is trying to see that this bit of *lese majeste* goes no farther. He is believed to favor the establishment of a Missouri Valley Authority—under Interior control. He favors development of the Columbia on the same basis, but has never suggested that control be outside his department.

Centralization of the marketing of federal power in an agency so firmly committed to public ownership and so bitterly critical of private ownership as is the Interior Department stands, of course, to promote municipal ownership. Beyond any doubt, Ickes will be forced for some years to sell much of the output of stations authorized in the Flood Control Bill to private companies, for the public agencies, municipals and co-ops, will not be in position to take it all immediately.

But Ickes has been trying for years—through at least eight referendums—to persuade San Francisco to municipalize. With widespread and plentiful power to sell, with authority to build transmission lines and with instructions to favor public bodies, a climate will be created which will be that much more favorable to municipalization. The public power crowd has never been hesitant to push for expansion of public ownership, and there is no reason to expect it will fail to do so under the more favorable climate.

Recapture Clauses

The contracts Ickes negotiated with Pacific Gas & Electric for Shasta energy and with Texas Power & Light for Denison output allows the recapture on relatively short notice of large blocks of the energy concerned. The same will be true of future contracts, for even if there were no disposition to keep energy commitments to private companies sufficiently fluid to allow the sale of federal energy to public power groups, the law will direct that this be done under the standard preference clause.

In rejecting the Bailey amendment and choosing instead the original committee amendment which gave Ickes the power with only small restriction on his right to build lines, the Senate saved itself the embarrassment of having to follow the Flood Control Bill with more legislation implementing its desire that savings realized by private companies through the purchase of federal energy be passed along to consumers. The Bailey amendment required this but made no provision for anyone to determine what savings were realized nor for enforcement, except in states having no electric regulation.

NEWS OF THE WEEK

lood Control Bill Goes to Conference Committee

use Likely to Agree to Broad Senate Amendments—St. Lawrence d MVA Projects Dropped—Missouri River Will Be Developed Jointly Army Engineers and Reclamation Bureau—Irrigationists Victors

The Flood Control Bill was before a nference committee this week after failure of Senators George D. Aiken, rmont Republican, and James E. rray, Montana Democrat, to insist pectively on including therein the Lawrence seaway and power pro- t and the Missouri Valley Authority. The measure was passed late last week d went to conference immediately, h one senate leader predicting that le difficulty would be experienced obtaining House agreement to broad nate amendments. Since the bill thorizes projects in many districts d states, the total cost in excess of ,100,000,000, it is not anticipated that ngressmen will risk final enactment of e bill.

The Missouri River, around which st of the two-weeks-long debate on e measure centered, will be developed intly by the Army Engineers and the terior Department's Reclamation ureau under an amendment which bstituted for the Engineers Pick Plan, riginally included in the bill, the re- nt "Missouri Compromise" reached the Engineers and the Reclamation ureau (ELECTRICAL WORLD, November 3, page 9). Each agency will prose- te its part of the reconciled version the Pick and Sloan (Reclamation) lans for the Missouri River, and appro- riations of $200,000,000 each were uthorized.

Passage of a Missouri Valley Author- y bill by the next Congress might ring about a change in this authoriza- on and substitute for it the require- ent that the MVA prepare a plan of s own. The Flood Control Bill con- ains no appropriations but merely authorizes projects and appropriations for them; so there is virtually no chance that any work will have been done by the time an MVA Bill is considered next year.

Irrigationist senators from the Northwest won a victory when they succeeded in writing into the bill the provision that use for navigation of waters rising west of the 98th meridian shall be permitted only insofar as it does not conflict with beneficial consumptive uses of such water, present or future.

A provision guarding the rights of states to be heard upon future proposals for flood control was also written into the bill, and the intra-New England controversy which found Vermont opposing certain projects favored by Massachusetts and Connecticut as flood control works on the Connecticut River, was settled by substituting eight small dams for one large dam in Vermont. This agreement also junked an amendment which a Senate committee had written into the bill forbidding generation of power at any flood control dam on the Connecticut or its tributaries which was authorized in the bill.

Projects approved by the House for flood control and power installations on the Raystown Branch of the Juniata River and the Youghiogheny River, both in Pennsylvania, were stricken from the list of authorizations and inserted in the list of projects of which the Chief of Engineers is directed to make preliminary examinations and surveys. Another flood control-power project on the Yadkin-Pee Dee River basin in South Carolina was stricken from the list of authorized projects and referred to the Senate commerce committee for hearings, at the insistence of Senator Josiah W. Bailey, South Carolina Democrat, who objected to the flooding of land for power purposes.

Murray withheld his MVA amendment after he was defeated on an attempt to transfer to the Interior Department all civilian employees of the War Department engaged in river development work, along with jurisdiction over river work now held by the Army Engineers. Part of the agreement was the assurance that prompt action will be had on proposals for an MVA next session. Aiken's agreement to withhold his St. Lawrence amendment was believed predicated in large part upon the compromise worked out to settle the fight over flood control on the Connecticut River.

Rivers Bill Taken Up

Taking up the Rivers and Harbors Bill, which provides for nine power projects in addition to more than 200 stream improvement projects, the Senate approved for it the same policy declarations with respect to state review of proposed projects as it included in the Flood Control Bill. The same provision for development of the Missouri River as was included in the Flood Control Bill also was written into the Rivers and Harbors Bill, but action was temporarily deferred on a proposal to insert in the Rivers and Harbors Bill the same amendment giving Interior Secretary Harold L. Ickes marketing jurisdiction over power authorized in the measure as went into the Flood Control Bill. The committee amendment regarding power disposal provided that Ickes should not compete directly or indirectly with private companies by acquiring or constructing transmission lines.

A committee amendment which privided for construction of all ten dams proposed for the Snake River in Idaho, a tributary of the Columbia, was changed to provide that such dams as are necessary to provide slack water for navigation be built. The House had stipulated that three of ten dams be

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Many times in recent years public power projects have been voted upon without the specific issue of public versus private ownership arising as such. Senator Bailey raised it, defended it with considerable skill through long debate and brought it to a vote with its essential philosophy undamaged under the attack of the administration's heaviest senatorial artillery. The vote 42-27, was decisively for public power. Considerably closer election victories have been construed by the New Deal as mandates of the people. Public power didn't need its victory over the Bailey amendment, but, having won it, will be strengthened.

The Bailey vote demonstrated, furthermore, that party lines don't stand up on the power issue. If the Republican Party be an adjunct of the alleged power trust, it fell down on the Bailey amendment, for it mustered only 14 of the votes for it, while 13 G.O.P. votes went against the amendment. This is one reason why its unnecessary victory will strengthen public power.

More important on future federal power policy was the subsequent approval of an amendment establishing Interior Secretary Harold L. Ickes as the marketer of the energy generated at dams authorized in the Flood Control Bill. There is nothing new about placing power marketing authority in the Interior Department, for all federal power except TVA's output and that of a small, decrepit plant at the Soo which the Army sells, is already there. But some of it was delegated years ago before the existing ascendency of public ownership. Much of it came through the operations of the Bureau of Reclamation, which is in the Interior Department anyway, and some of it came by executive order. If the House goes along with the Senate, the existing policy will be strengthened indeed, by the inclusion in Interior's domain of projects all over the country, not just in the West. The amendment stands to gather up any loose ends in the policy and knot them securely, and is a logical enough move. One of the fears expressed by Senator Bailey was of a divergent application of federal authority over power in different sections of the country. Putting all the power marketing not performed by a regional authority under one agency should mean uniformity of policy.

Interior Control

As regards the exception, the marketing of its own power by TVA, Mr. Ickes apparently is trying to see that this bit of *lese majeste* goes no farther. He is believed to favor the establishment of a Missouri Valley Authority—under Interior control. He favors development of the Columbia on the same basis, but has never suggested that control be outside his department.

Centralization of the marketing of federal power in an agency so firmly committed to public ownership and so bitterly critical of private ownership as is the Interior Department stands, of course, to promote municipal ownership. Beyond any doubt, Ickes will be forced for some years to sell much of the output of stations authorized in the Flood Control Bill to private companies, for the public agencies, municipals and co-ops, will not be in position to take it all immediately.

But Ickes has been trying for years—through at least eight referendums—to persuade San Francisco to municipalize. With widespread and plentiful power to sell, with authority to build transmission lines and with instructions to favor public bodies, a climate will be created which will be that much more favorable to municipalization. The public power crowd has never been hesitant to push for expansion of public ownership, and there is no reason to expect it will fail to do so under the more favorable climate.

Recapture Clauses

The contracts Ickes negotiated with Pacific Gas & Electric for Shasta energy and with Texas Power & Light for Denison output allows the recapture on relatively short notice of large blocks of the energy concerned. The same will be true of future contracts, for even if there were no disposition to keep energy commitments to private companies sufficiently fluid to allow the sale of federal energy to public power groups, the law will direct that this be done under the standard preference clause.

In rejecting the Bailey amendment and choosing instead the original committee amendment which gave Ickes the power with only small restriction on his right to build lines, the Senate saved itself the embarrassment of having to follow the Flood Control Bill with more legislation implementing its desire that savings realized by private companies through the purchase of federal energy be passed along to consumers. The Bailey amendment required this but made no provision for anyone to determine what savings were realized nor for enforcement, except in states having no electric regulation.

NEWS OF THE WEEK

lood Control Bill Goes to Conference Committee

use Likely to Agree to Broad Senate Amendments—St. Lawrence d MVA Projects Dropped—Missouri River Will Be Developed Jointly Army Engineers and Reclamation Bureau—Irrigationists Victors

The Flood Control Bill was before a ference committee this week after failure of Senators George D. Aiken, rmont Republican, and James E. rray, Montana Democrat, to insist pectively on including therein the Lawrence seaway and power pro- t and the Missouri Valley Authority. The measure was passed late last week d went to conference immediately, h one senate leader predicting that le difficulty would be experienced obtaining House agreement to broad nate amendments. Since the bill thorizes projects in many districts d states, the total cost in excess of ,100,000,000, it is not anticipated that ngressmen will risk final enactment of bill.

The Missouri River, around which st of the two-weeks-long debate on measure centered, will be developed intly by the Army Engineers and the terior Department's Reclamation reau under an amendment which bstituted for the Engineers Pick Plan, iginally included in the bill, the re- nt "Missouri Compromise" reached the Engineers and the Reclamation reau (ELECTRICAL WORLD, November , page 9). Each agency will prose- te its part of the reconciled version the Pick and Sloan (Reclamation) ans for the Missouri River, and appro- iations of $200,000,000 each were thorized.

Passage of a Missouri Valley Author- bill by the next Congress might ring about a change in this authoriza- on and substitute for it the require- ent that the MVA prepare a plan of s own. The Flood Control Bill con- ins no appropriations but merely authorizes projects and appropriations for them; so there is virtually no chance that any work will have been done by the time an MVA Bill is considered next year.

Irrigationist senators from the Northwest won a victory when they succeeded in writing into the bill the provision that use for navigation of waters rising west of the 98th meridian shall be permitted only insofar as it does not conflict with beneficial consumptive uses of such water, present or future.

A provision guarding the rights of states to be heard upon future proposals for flood control was also written into the bill, and the intra-New England controversy which found Vermont opposing certain projects favored by Massachusetts and Connecticut as flood control works on the Connecticut River, was settled by substituting eight small dams for one large dam in Vermont. This agreement also junked an amendment which a Senate committee had written into the bill forbidding generation of power at any flood control dam on the Connecticut or its tributaries which was authorized in the bill.

Projects approved by the House for flood control and power installations on the Raystown Branch of the Juniata River and the Youghiogheny River, both in Pennsylvania, were stricken from the list of authorizations and inserted in the list of projects of which the Chief of Engineers is directed to make preliminary examinations and surveys. Another flood control-power project on the Yadkin-Pee Dee River basin in South Carolina was stricken from the list of authorized projects and referred to the Senate commerce committee for hearings, at the insistence of Senator Josiah W. Bailey, South Carolina Democrat, who objected to the flooding of land for power purposes.

Murray withheld his MVA amendment after he was defeated on an attempt to transfer to the Interior Department all civilian employees of the War Department engaged in river development work, along with jurisdiction over river work now held by the Army Engineers. Part of the agreement was the assurance that prompt action will be had on proposals for an MVA next session. Aiken's agreement to withhold his St. Lawrence amendment was believed predicated in large part upon the compromise worked out to settle the fight over flood control on the Connecticut River.

Rivers Bill Taken Up

Taking up the Rivers and Harbors Bill, which provides for nine power projects in addition to more than 200 stream improvement projects, the Senate approved for it the same policy declarations with respect to state review of proposed projects as it included in the Flood Control Bill. The same provision for development of the Missouri River as was included in the Flood Control Bill also was written into the Rivers and Harbors Bill, but action was temporarily deferred on a proposal to insert in the Rivers and Harbors Bill the same amendment giving Interior Secretary Harold L. Ickes marketing jurisdiction over power authorized in the measure as went into the Flood Control Bill. The committee amendment regarding power disposal provided that Ickes should not compete directly or indirectly with private companies by acquiring or constructing transmission lines.

A committee amendment which privided for construction of all ten dams proposed for the Snake River in Idaho, a tributary of the Columbia, was changed to provide that such dams as are necessary to provide slack water for navigation be built. The House had stipulated that three of ten dams be

built, at each of which power was to be installed.

After considerable debate, the Senate rejected an amendment authorizing the Tennessee-Tombigbee waterway, which had also been rejected by the House last spring.

Disposition of the controversial St. Lawrence seaway and power project which is before a Senate commerce subcommittee which held hearings to determine whether the 1941 executive agreement authorizing the project could be acted upon as legislation, requiring a majority of both Houses, or as a treaty with Canada, requiring a two-thirds vote of the Senate, was held up pending a report by the State Department. A representative of the department urged that the agreement be handled as legislation, but an expert on constitutional law from the Yale Law School, described by Aiken as "paid by the utilities," urged the contrary.

If the committee determines that the agreement must be handled as a treaty, as seems likely, it will go to the Senate Foreign Affairs Committee, although Aiken will be free to introduce it as an amendment of the pending Rivers and Harbors Bill. Fear that the device might be used by the Administration as a means of circumventing the Senate's right to pass on treaties has been voiced by several senators.

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It was emphasized that the cutbacks resulted from an oversupply of magnesium and that no consideration was given to possible energy or fuel savings in determining which plants should be closed.

Plants affected by the cutbacks were those operated by the Electro Metallurgical Co., Spokane; Dow Chemical Co., Velasco, and the Diamond Magnesium Co., at Painesville.

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Senator Lister Hill, Alabama Democrat and strong administration supporter, is reported to have a bill for such an agency already drawn. Hill is said to have agreed not to introduce the measure for some weeks, probably not until the 79th Congress convenes in January.

Whether the proposed agency is to be an independent agency or affiliated with REA is not entirely clear. Most previous discussion of such a move has coupled the agency with REA, but it is believed that some effort will be made to use the pending proposal as an attempt to pry REA loose from its present place in the Department of Agriculture.

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REA has been experimenting with rural telephony in conjunction with the American Telephone & Telegraph Co. The latter has developed a carrier current set which would tap rural power lines to carry messages, with a lead-off to a central station which could be connected with other A. T. & T. lines, allowing nation-wide connections. The set has been perfected to a point at which it would be practicable although final designs have not yet been approved. It is estimated that service with existing equipment would cost about $35 a year which is well above the rate farmers generally are willing to pay. This charge would include carrying charges on the equipment, telephone service and maintenance. Considerable attention is being devoted to lowering the annual cost.

The drive for increased rural telephone service was helped along recently by R. C. Wakefield, of the Federal Communications Commission, who told the annual convention of the National Association of Railroad and Utilities Commissioners at Omaha that the need for such service is not debatable. Wakefield added that he did not know whether it could best be rendered by the Bell System, by independent companies or by "cooperative associations."

FCC recently released a report on rural telephony showing that while rural electrification was expanding rural telephone service was dwindling, showing a 39 percent decrease between 1920 and 1940. In 1920, the report showed, there were 2,498,493 telephones on farms. By 1930 there were 2,139,194, and by 1940, 1,526,954.

The report pointed out that "during the period of rapidly falling farm income, the cost of telephone service to farmers increased rather than decreased, that the possibilities of obtaining cheaper farm telephone service were diminished by the reduction in the number of cooperative telephone companies and that the extension of control and influence by the Bell System over independent companies changed the policies of the latter so that greater emphasis was placed on maintaining and increasing rates than on lowering rates.

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Utility Sued to Determine Validity of Columbus Tax

Validity of the 5 percent utilities tax of Columbus, Ohio, is being contested in a taxpayer's suit begun by Robert Beatty in the Franklin County Common Pleas Court. Ignoring the city which enacted the ordinance, Beatty has sued the Columbus and Southern Ohio Electric Co. charging he was compelled to pay $1.58 tax on his electric bill.

Mr. Beatty has also asked for an accounting by the company of the amount of tax collected from consumers of electrical energy in the city. In the event the company refuses to answer, Mr. Beatty asks $250,000 judgment on behalf of the electrical consumers of the city.

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Consumers Power Co. will reduce its December bills 75 percent in compliance with an order of the Michigan Public Service Commission, Dan E. Karn, vice-president and general manager, has announced.

Mr. Karn said that the saving in federal excess profits taxes will not entirely compensate for the cut. The commission said the reduction would permit the company to avoid 80 percent of its excess profits taxes for 1944.

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Despite unfavorable reports reaching San Francisco on the reception plans were receiving from the Interior department, city officials exhibited confidence in the proposals by reported determination to defend them in court.

Originally proposed by the irrigation districts and backed by the city, plans were taken to Washington by Clifford Plummer, Modesto irrigation district engineer, and Vernon S. Gant, attorney for the district.

Though plans were believed to conform to the Raker Act, which specifically allows for sale to municipalities, municipal districts and irrigation districts, the question of resale of Hetch Hetchy power by the irrigation districts is still to be answered.

Themselves generating power on the Tuolumne River below Hetch Hetchy for irrigation purposes and sale to the P.G. & E., districts would absorb Hetch Hetchy power into their system and enlarge sales to the private utility. Difference between Hetch Hetchy output (580,000,000 kw.-hr. last year) and amount of power used by the districts (135,000,000 kw.-hr. last year) presumably would be sold to the P.G. & E.

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General Committee is divided into four major sections: Residential, Commercial, Industrial, Rural. Each of these sections will be directed by a vice-chairman of the Commercial Division General Committee in charge of that particular section. Under each of these sections are several committees, each in charge of a chairman who reports to the vice-chairman of the Commercial Division in charge of his particular section.

Three special committees have also been set up independent of the four major sections but which cross the interest of all of them. These are the Commercial Planning, Basic Sales Training and Wiring Committees.

Classifications Complete

The comprehensive coverage of applications in the several classifications of service is noted in the list of committees which follows. In the Residential Section are the Lighting, Electric Kitchen, Electric Laundry, Water Heating, Indoor Climate, Home Service, Dealer Coordination, and Sales Personnel Committees. The Commercial Section includes the Lighting, Commercial Cooking and Baking, Market-Development, Motor Application, and Sales Personnel Committees. The Industrial Power Section includes committees on Industrial Lighting, General Power and Heating, Competitive Service, and Sales Personnel. The Rural Section also has four committees—one each on Service Extension, Farm Utilization, Equipment Distribution and Sales Personnel.

It is anticipated that the survey, analysis of markets and deliberations on problems of development of these markets will bring to the commercial forces of the industry a valuable and helpful service.

The personnel of the Commercial Division General Committee is as follows:

Chairman—G. W. Ousler, Duquesne Light Co.; P. M. Alden, Philadelphia Electric Co.; F. A. Coffin, Wisconsin Electric Power Co.; C. A. Collier, Georgia Power Co.; A. C. Crandall, Indianapolis Power & Light Co.; D. M. DeBard, Stone & Webster Service Corp.; F. S. Dewey, Cincinnati Gas & Electric Co.; H. E. Dexter, Central Hudson Gas & Elec. Corp.; R. E. Fisher, Pacific Gas & Electric Co.; R. A. Gibson, Hartford Electric Light Co.; R. F. Hartenstein, Ohio Edison Co.; E. L. Kavanaugh, Detroit Edison Co.; E. F. Kelly, Central Illinois Public Service Co.; C. D. Lawrence, New England Power Service Co.; C. H. Leatham, Monongahela West Penn Public Service Co.; A. V. S. Lindsley, Connecticut Light & Power Co.; A. D. McLay, Detroit Edison Co.; C. E. Michel, Union Electric Co. of Missouri; J. E. North, Cleveland Electric Illuminating Co.; W. E. Parrott, Ebasco Services Inc.; J. F. Porter, Jr., Kansas City Power & Light Co.; P. H. Powers, West Penn Power Co.; Harry Restofski, West Penn Power Co.; M. R. Rodger, Middle West Utilities Co.; H. M. Sawyer, American Gas & Electric Service Corp.; M. E. Skinner, Buffalo Niagara & Eastern Power Corp.; H. P. J. Steinmetz, Public Service Electric & Gas Co.; R. H. Tillman, Consolidated Gas Electric Light & Power Co.; Edwin Vennard, Middle West Service Co.; G. E. Whitwell, Philadelphia Electric Co.; H. E. Young, Northern States Power Co.

Vice-chairmen of the four sections are: Residential, Mr. Restofski; Commercial, Mr. Alden; Industrial, Mr. Kavanaugh; Rural, Mr. Leatham.

Chairmen of the three special committes are: Commercial Planning Committee, Mr. Skinner; Basic Sales Training Committee, Mr. Rodger; Wiring Committee, Mr. Hartenstein.

DIAMOND BADGE WINNER—Percy S. Young, right, chairman of the executive committee of the Public Service Electric & Gas Co., pins a diamond badge on Collon K. Meyers, supervisor, Customers Service Department, Jersey City Commercial, who has completed 50 years of service with the company and its predecessors. The award was made at a dinner at which the veteran was also given a gold watch

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December Power Is Free

Maintaining a custom began five years ago, city council at East Palestine, O., voted a Christmas "bonus" to the 1,800 subscribers of its municipal power plant in the form of paid December light bills. Commercial bills were given a 50 percent discount. City's earnings in the five years have permitted it to chalk off $40,000 in patrons' December bills. The rebating actually means an 8½ percent reduction in light rates, making East Palestine's rates the lowest in the state, said Mayor Water Hunston.

Philadelphia Limits Poles Near Airpor

Philadelphia has passed an ordinan creating flight zones around all muni pal airports in which all poles and oth structures are prohibited or else limit in size. The ordinance also provides the compensation to all property owne for any damage or loss sustained them in removing such structures or their removal.

The flight zones vary in size as whether or not they are to be used f instrument landings and takeoffs, b in both cases the depth of the zone two miles. The zone for instrume flying is 1,000 feet wide at the end the concrete runway and 4,000 feet wi at the two-mile mark. Obstacles sha not be more than one foot in height f every 40 feet measured perpendicul to the end of the runway. The zone f non-instrument flying widens from 5 feet at the end of the runway to 2,5 feet at the two-mile mark. Obstacl may be one foot in height for every feet measured perpendicular to the en of the runway.

City authorities are given the right remove any obstacles in violation of th ordinance and to erect signal ligh marking the flight zones or nearby o stacles upon payment of damages to th property owner.

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Suit Against Utah P. & L. Co Dismissed in Federal Cour

A suit brought by Oregon stockhol ers of Utah Power & Light Co. a tempting to void recent sale of tran portation properties of Utah Light Traction Co., a subsidiary of U.P.&L to Salt Lake City Lines, was dismisse without prejudice against refilin November 10, by Federal Judge Tillma D. Johnson.

The Oregon stockholders had at tempted to prove they had a purchase willing to pay $800,000 for the prop erties sold to Salt Lake City Lines fo $675,000. The defendant corporation replying, asked why this person ha not responded when the property wa offered for sale.

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May Extend Rural Lines

Arkansas Department of Public Utili ties has granted the Arkansas Power & Light Co. permission to extend its rural power lines in White county 82.7 miles at an estimated cost of $66,00 to serve 353 customers. The First Elec tric Cooperative Corp. entered an ap pearance but did not intervene.

First I.C.I. Chapter Inducted at Buffalo

First local chapter to become affiliated with Indoor Climate Institute, the Air Conditioning Council of Western New York was inducted in the national organization at a conference in Buffalo on November 14. The meeting was attended by more than 120 dealers and industry representatives as well as officers and directors of I.C.I. The new chapter will be known as Indoor Climate Institute of Western New York.

In accepting the charter from Paul B. Zimmerman, national president, Walter E. Voisinet, president of the local group, outlined the objectives and history of the Air Conditioning Council. He pointed out that the organization was formed in April, 1937.

The first president of the Air Conditioning Council was Louis A. Harding, nationally known for his writings on air conditioning. He was followed successively by Roswell Farnham of the Buffalo Forge Co., Richard H. Mollenberg of the Mollenberg-Betz Machine Co., Joseph Davis of the Davis Refrigeration Co., Edwin R. Cooney of the Cooney Refrigeration Co. and, in 1942, by the present executive officer, Walter E. Voisinet.

During its seven years of local activity in Western New York, the Air Conditioning Council has sponsored many activities in the heating, cooling and air conditioning fields. It has been instrumental in providing a definite cooperative attitude and ethical standards among its members.

While the Council has been purely a promotional institution, it has, among other things, been active, in association with the Medical Society of the County of Erie, in conducting a clinic on the benefits of controlled indoor climate to people suffering from hay fever. Another public service was the adoption of standard summary sheets in order that customers could better check bids received. It has published and distributed several pieces of literature outlining the benefits to be derived from proper heating and air conditioning equipment. The group has been active in legislative matters affecting the industry.

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Iowa Electric Light Plans 10,000-Kw. Generating Unit

Iowa Electric Light & Power Co., Cedar Rapids, recently received War Production Board approval for the construction of a 10,000-kw., turbo-generating unit for its Boone, Iowa station. The new unit, to be manufactured by the Allis-Chalmers Manufacturing Co., is to operate at a steam pressure of 650 lb., and a temperature of 750 deg.

Present installed capacity at Boone station is 7,100 kw., but because of limitations of steam capacity present capability is 5,700 kw. Installation of the new turbine plus the new high pressure boiler which has been completed will triple the station's capacity.

In addition to the turbine, a new 10,000-kva. transformer will be installed at this plant to connect the new machine with the 33-kv. bus. About 14 months will elapse before the new unit will be placed in operation.

THIS IS NO. 1—Paul B. Zimmerman, left, national president of Indoor Climate Institute, presents Walter E. Voisinet, president of Indoor Climate Institute of Western New York, the first charter granted to a local group

I.E.S. Ends Agreement for Lamp Certification

The Illuminating Engineering Society has notified Electrical Testing Laboratories, Inc. of its withdrawal from the agreement under which the certification of conformity of portable lamps with specifications has been carried out. The termination is to be effective not later than July 1, 1945.

Under the agreement, made November 10, 1937, I.E.S. undertook to make specifications available, to designate a laboratory or laboratories for testing lamps under such specifications, and to authorize such laboratory or laboratories to use the official I.E.S. insigne on its certificates attached to the lamps. ETL undertook to render a testing and certification service.

I.E.S. which henceforth will prepare only luminaire performance recommendations feels it can be of more constructive service by leaving to those commercially interested the preparation of specifications that may be consistent with and derived from the Society's performance recommendations.

Manufacturers who will engage in joint technical promotion of portable lamps have adopted the name, "Certified Lamp Manufacturers," which name will be usable by all manufacturers of portable lamps who execute contracts for test-certification services with ETL and who manufacture equipment that complies with the Certified Lamp Manufacturers' specifications.

An ETL certification emblem insigne is being designed to replace the IES insigne previously used on lamps conforming to specifications.

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Utah Power Stockholders Approve Retirement Pay

Preferred stockholders of Utah Power & Light Co. have voted 4 to 1 to approve a retirement income plan for company employees. Average retirement pay under the plan will be about $60 a month, and the maximum possible, $300. Financed through a trust fund, the plan will cost the company over $40,000 annually.

"Adoption of this plan," George M. Gadsby, president and general manager, said, "rounds out a security program prepared by Dr. Adam S. Bennion a few years ago and upon which he worked until he left the company in June, 1944. The new retirement plan, his previously established group and hospitalization insurance, and the Mutual Aid Association afford a good measure of security within the company."

Pacific G. & E. Denies Being N.A. Subsidiary

Counsel for Pacific Gas & Electric Co. told the Supreme Court this week that the Public Utility Holding Company Act of 1935 requires regulation of the company by the Securities and Exchange Commission only if P. G. & E. is in fact dominated and its policies governed by the North American Co.

The contention was argued as the company sought reversal of a lower court ruling which upheld SEC's refusal to grant P. G. & E.'s request that it be termed no subsidiary of North American even though the latter owned more than 10 percent of P. G. & E.'s stock.

Counsel for the company argued that even though North American held P. G. & E. stock in excess of the 10 percent minimum allowed by the Holding Company Act—the primary basis on which operating companies are to be considered subsidiaries of holding companies—P. G. & E. is in fact operated by West Coast people and that North American does not dominate P. G. & E. policy, dictate its operations or pass on its activities. Under the act, counsel added, the SEC is required, on application, to hold an operating company no subsidiary of a holding company which owns 10 percent or more of the operating company's stock if the operating company can show that its policies and activities are not dominated by the holding company.

Counsel pointed out that North American has consistently decreased its holdings of P. G. & E. stock from 19 percent some years ago to 17 percent when the matter was heard by SEC in 1941. North American holdings have been reduced since that time to 13 percent of P. G. & E. stock by the issuance of P. G. & E.'s stock as dividends on North American securities. By January 1, 1946, it was argued, North American's holdings of P. G. & E. stock, originally obtained when P. G. & E. purchased a North American subsidiary, will be below the 10 percent minimum.

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Named Redemption Agent For Metropolitan Edison

Chemical Bank & Trust Co., New York, has been appointed redemption agent of Metropolitan Edison Co. for the redemption on January 1, 1945 of all outstanding prior preferred and cumulative prefered stock at $105 and $110 per share, respectively, plus accrued dividends to the date of redemption.

Bond & Share Announces Executive Appointments

Electric Bond & Share Co. and American & Foreign Power Co., Inc., a subsidiary holding company, have announced changes in executive personnel.

Bond and Share has announced the election by the board of directors of C. E. Groesbeck as chairman of the executive committee; Curtis E. Calder as chairman of the board of directors; George G. Walker as president; Lester B. Wiegers as vice-president and B. M. Betsch as assistant secretary-treasurer.

Foreign Power has announced the election by its board of directors of W. S. Robertson as president.

MEETINGS

Dielectric and Induction Heating Conference—Sponsored by Great Lakes Power Club and Chicago Lighting Institute, Marquette Auditorium, 140 So. Dearborn St., Chicago, Ill., January 16-18. C. W. Zersen, Conference Committee, 72 West Adams St., Chicago 3, Ill.

Previously Listed

Pennsylvania Electric Association — Meter committee, Benjamin Franklin Hotel, Philadelphia, Pa., December 14-15. B. M. Smith, chairman, P. O. Box 1101, Erie, Pa.

Technical Valuation Society — Annual forum and business meeting, Building Trades Club, 2 Park Ave., New York, N. Y., December 16. W. C. Fisher, chairman, Room 516, 4 Irving Place, New York, N. Y.

Missouri Valley Electric Association—Annual power sales conference, Continental Hotel, Kansas City, Mo., January 17-18. I. D. Pettegrew, director, 1527 Sharp Bldg., Lincoln 8, Neb.

American Society of Civil Engineers — Annual meeting, Commodore Hotel, New York, N. Y., January 17-19. George T. Seabury, secretary, 33 West 39th St., New York 18, N. Y.

Canadian Electrical Association — Annual winter conference, Mount Royal Hotel, Montreal, January 18-19. B. C. Fairchild, managing director, 704 Tramways Bldg., Montreal 1, Que.

American Institute of Electrical Engineers — National technical meeting, Engineering Societies Bldg., New York, N. Y., January 22-26. H. H. Henline, secretary, 33 West 39th St., New York 18, N. Y.

Institute of Radio Engineers — Winter technical meeting, Hotel Commodore, New York, N. Y., January 24-27. W. B. Cowilich, secretary, 330 W. 42nd St., New York 18, N. Y.

National Association of Purchasing Agents—Public Utility Buyers' Group, mid-winter meeting, Wm. Penn Hotel, Pittsburgh, Pa., February 1-2. J. K. Hall, chairman, Columbus & Southern Ohio Electric Co., Columbus 15, Ohio.

Pennsylvania Electric Association—Electrical equipment committee, Hotel Roosevelt, Pittsburgh, Pa., February 8-9. B. E. Hagy, chairman, Philadelphia Electric Co., 900 Sansom St., Philadelphia, Pa.

Edison Electric Institute — Transmission and distribution committee, Wm. Penn Hotel, Pittsburgh, Pa., February 15-16, electrical equipment committee, Netherland Plaza Hotel, Cincinnati, Ohio, February 14-15; accident prevention committee, Cleveland Hotel, Cleveland, Ohio, February 15-16. Col. H. S. Bennion, managing director, 420 Lexington Ave., New York 17, N. Y.

American Society for Testing Materials—Committee week, Wm. Penn Hotel, Pittsburgh, Pa., February 26-March 2 (spring meeting, February 28). R. J. Painter, assistant to the secretary, 260 So. Broad St., Philadelphia 2, Pa.

Florida Power Abandons Tampa Bay Line Plans

Tampa, Fla., Chamber of Commerce apparently has won its fight to prevent the Florida Power Corp. from constructing a heavy transmission line across Tampa Bay (ELECTRICAL WORLD, August 5, Page 98).

A. W. Higgins, president of the company, has notified the chamber that the application to the United States Engineers office for the line has been withdrawn.

The application showed that the proposed line would run from St. Petersburg to a point a mile north of Piney Point, and that it would consist of a high line for a considerable distance out from each shore leading to a central submarine cable for a distance of 14,500 ft.

Objections are that an underwater cable would interfere with dredging operations and the anchoring of vessels in the bay and that an overhead line would be dangerous during storms and would be difficult to maintain. In the latter type of construction, the towers are labeled dangerous to tugs and other small craft by opponents of the new line who claim that the power company can get the connection desired through use of Tampa Electric Co. lines around the bay.

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Co-ops Oppose Expansion Plan of Kentucky Utilities

Electric cooperatives of Kentucky will oppose the rural electrification plan of the Kentucky Utilities Co. at the hearings which begin December 11 before the Public Service Commission.

H. Curtis Brown, president of the Kentucky Rural Electric Cooperative Corp. at a recent meeting called the K.U. plan a "piecemeal" one "to grab off the more populous unelectrified communities in 64 counties." He said that the utility company would add only 1,246 customers or an average of six to the mile while co-ops now have only 3.5 customers to the mile and are willing to lower the average when post-war expansion begins. As an alternative, the co-ops will present at the hearings a program based on area coverage.

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Would Tax All Utilities

Mayor Edward Bass of Chattanooga, Tenn., is behind a campaign to tax all utilities operating in the city including the Electric Power Board of Chattanooga. The state legislature must act before the utilities can be taxed.

Output Curve Moves Sharply Upward

The electric output curve moved sharply upward during the week ended December 2, 1944, according to figures released by the Edison Electric Institute. The amount of electrical energy distributed by the light and power industry amounted to 4,524,257,000 kw.-hr., as compared with 4,368,519,000 kw.-hr. the preceding week ended November 25, 1944. Figures for the week represented a decrease of 0.8 percent under the 4,560,158,000 kw.-hr. distributed during the corresponding week a year ago.

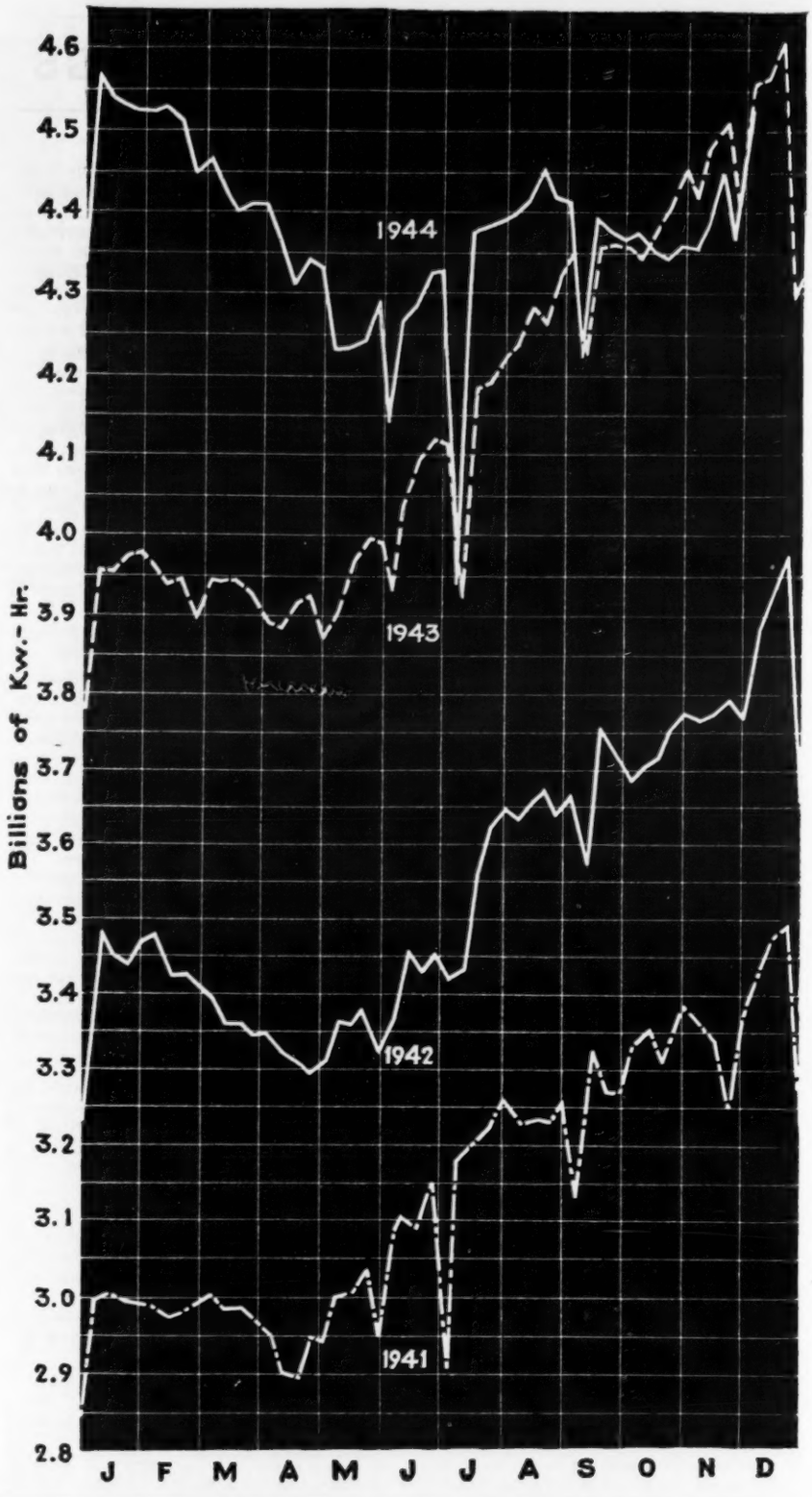
Three of the seven major geographic regions of the country reported losses for the week ended December 2, 1944, as compared with the corresponding week in 1943—the same groups as the preceding week, Mid-Atlantic, Rocky Mountain and Pacific Coast. The Mid-Atlantic group cut its losses slightly, but the Rocky Mountain and Pacific Coast states reported higher losses during the week ended December 2, as compared with the corresponding week in 1943, than in the week ended November 25. Slight increases were reported by the New England and the Central Industrial groups, but the gains of the West Central and the Southern States were reduced.

Weekly Output Millions Kw.-Hr.

1944		1943		1942	
Dec. 2	4,524	Dec. 4	4,560	Dec. 5	3,884
Nov. 25	4,369	Nov. 27	4,403	Nov. 28	3,766
Nov. 18	4,450	Nov. 20	4,513	Nov. 21	3,795
Nov. 11	4,397	Nov. 13	4,483	Nov. 14	3,776
Nov. 4	4,355	Nov. 6	4,414	Nov. 7	3,762
Oct. 28	4,358	Oct. 30	4,453	Oct. 31	3,775
Oct. 21	4,345	Oct. 23	4,415	Oct. 24	3,753
Oct. 14	4,355	Oct. 16	4,382	Oct. 17	3,717
Oct. 7	4,375	Oct. 9	4,342	Oct. 10	3,702
Sept. 30	4,366	Oct. 2	4,359	Oct. 3	3,683
Sept. 23	4,377	Sept. 25	4,360	Sept. 26	3,720
Sept. 16	4,395	Sept. 18	4,359	Sept. 19	3,757

Percent Change from Previous Year

	Week Ending		
	Dec. 2	Nov. 25	Nov. 18
New England	+ 1.8	+ 1.7	+ 0.9
Mid Atlantic	— 3.7	— 4.6	— 5.2
Central Industrial	+ 2.5	+ 1.6	+ 1.4
West Central	+ 5.1	+ 7.1	+ 7.0
Southern States	+ 2.3	+ 2.9	+ 2.8
Rocky Mountain	—10.9	—10.5	—12.6
Pacific Coast	— 4.0	— 2.5	— 4.3
Total United States	— 0.8	— 0.8	— 1.4



Co-op in Arkansas Wants Territory Granted A. P. & L.

Petit Jean Electric Cooperative, which has planned to construct rural electric lines in Conway County, Arkansas, will contest an order of the Department of Public Utilities allotting the territory to the Arkansas Power & Light Co.

The department, in an order issued November 9, granted the private utility's application to build 23.5 miles of lines in Conway County at a cost of $18,845 to serve 106 customers and dismissed the cooperative's intervention.

J. G. Moore, attorney for the cooperative, said the first step probably would be to ask for a rehearing.

Will Install Generator

United Illuminating Co. will install at Bridgeport, Conn., a turbine-driven generator which will use high pressure steam and will have a maximum capacity of 7,500 kw. producing electricity at 13,800 volts. President William C. Bell announced the cost at $450,000.

SEC DECISIONS—HEARINGS

The Securities and Exchange Commission, in a series of orders recently issued affecting electric utility companies:

HAS ORDERED the Columbia Gas & Electric Corp., system to dispose of $196,000,000 of its assets, including six operating companies in the "Dayton-Cincinnati" group and incidental investments in eleven other companies. The commission found elimination of these interests necessary for Columbia's compliance with geographic integration provisions of the Holding Company Act. Columbia is to divest itself of the Cincinnati Gas & Electric Co. Dayton Power & Light Co., Miami (Ohio) Development Co., Miami Power Corp., Union Light, Heat & Power Co. of Covington, Ky., and West Harrision (Ind.) Electric & Water Co., Inc.

APPROVED SALE of all securities of the Glacier Production Co., Butte, Mont., to the American Power & Light Co., owned by Glacier's parent, the Montana Power Co. The SEC authorized Montana Power to turn over 6,000 common shares of Glacier, valued at $660,000 and $3,690,000 of debentures to American Power. In return, according to SEC, American Power will pay $9,900,000 and "cause the conveyance of title to the natural gas properties owned by Glacier Production to Montana Power and cause the successor in interest to the oil properties owned by Glacier to continue the operation and development of such gas properties for the benefit of Montana Power." The commission also ordered Glacier to pay American Power $650,000, plus accrued interest, in settlement of notes held in that amount by American Power. Oil properties of Glacier are to be transferred to the Union Oil Co. of California, the SEC stated.

HAS APPROVED the sale by Associated Electric Co. of its entire interest in the securities and indebtedness of its wholly owned subsidiary, Missouri General Utilities Co., to five cooperatives and the city of Rolla, Mo., for a base price of $1,610,000, subject to adjustments.

PERMITTED PAYMENT on December 1 of a 25 cent dividend to common stockholders of record November 22 of the Ogden Corp. The dividend, estimated at $850,918 will be charged to Ogden's $593,210 earned surplus and the excess to its $1,289,569 capital surplus.

APPROVED PROXY solicitation material submitted by Arkansas Missouri Power Corp. for use in connection with proposed issuance and sale of $2,000,000 first Series A 3¼s due 1974.

RELEASED JURISDICTION over legal fees and expenses incurred in merger of Virginia Public Service Co. into Virginia Electric & Power Co.

Applications Filed

SOUTH CAROLINA POWER CO. and its parent, Commonwealth & Southern Corp. have filed a plan for refinancing South Carolina Power. Under the plan South Carolina would retire $9,861,000 principal amount of 5 percent bonds and 28,573 shares of $6 preferred stock by: redeeming $1,600,500 of 5 percent bonds and 23,023 shares of $6 preferred stock publicly held; acquiring from Commonwealth $3,411,000 of 5 percent bonds at $2,855,562, Commonwealth's cost; Commonwealth's surrender of $1,850,000 of 5 percent and 5,500 shares of preferred stock at its cost, $2,292,831; issuing and selling $8,000,000 of new 30-year bonds bearing not more than 3½ percent interest, and borrowing $2,400,000 from banks and 2½ percent installment notes. After the refinancing is completed, South Carolina will have outstanding the new bonds, $1,559,000 of 5 percent noncallable divisional bonds, $2,400,000 of bank loans and 600,000 of common stock. South Carolina would use the proceeds from the sale of new bonds and bank loans to redeem on Jan. 1, 1945, $641,500 of Georgia-Carolina Power Co.'s 5 percent 40-year first mortgage sinking fund gold bonds, due 1952 at 105 percent of principal amount; redeem its own 5 percent bonds at 102.2 percent, reacquire the bonds held by Commonwealth and redeem the publicly held preferred stock at $110 per share.

INDIANA SERVICE CORP. has filed an amendment to its reorganization plan, providing for payment of the redemption price on bonds to be retired. The $6,945,000 of 5s, 1950, are redeemable at 102½ percent of face value and the $5 million of 5s, 1963, are redeemable at 104 percent. Under terms of the reorganization plan filed on October 7, last, the bonds were to have been paid off at face value, without premiums. The two principal objections to the plan are that the $11,900,000 of new bonds provided therein is too heavy in relation to the $15,000,000 net valuation of properties as adjusted to reflect the write-down of traction facilities, and that the $2,500,000 cash and $500,000 one and two year demand notes to be given in satisfaction of the $4,200,000 intercompany debt owing the Midland Utilities Co. parent are too large.

MASSACHUSETTS UTILITIES ASSOCIATES, has asked approval of its proposal to borrow $3,000,000 from First National Bank of Boston to pay an unsecured note owing to the bank and due February 9, 1945. The new note will have an interest rate of 2½ percent.

MISSISSIPPI POWER CO., a subsidiary of Commonwealth & Southern Corp., has filed a request for authorization to redeem with treasury cash all of the 18,246 issued and outstanding shares of its $7 preferred stock at the redemption price of $110 a share, plus accrued dividends. Mississippi Power proposes to account for the redemption by charging the excess of the redemption price over $100 a share to earned surplus, and by charging an amount equal to $100 a share, being the amount of capital represented by the shares, to preferred stock capital account. In this connection, the company proposes to reduce its capital from $8,334,500 to $6,509,900.

NORTHERN STATES POWER CO. (Minn.) would purchase properties of Afton Power Co., for $75,000 from the heirs of the late Alfred R. Schultz under a plan filed with SEC. The property consists of the electric distribution facilities serving Lakeland, Lake St. Croix Beach and St. Mary's Point as well as rural areas of Washington County, Minn. Northern State's offer to purchase the properties is conditioned on the sale of its Willow River Power Co., electric properties to a subsidiary, Northern States Power Co., of Wisconsin.

Hearing Scheduled

DECEMBER 13: On reasonableness of fees and expenses incurred during the recapitalization of International Utilities Corp. The hearing has been postponed from December 5.

UTILITY REPORTS

	Net Income 1944	1943
*Cleveland Electric Illum...	$5,898,942	$6,255,059
†Connecticut Light & Power	3,857,641	3,738,002
†Detroit Edison and subs...	8,452,596	8,273,302
*Duquesne Light	10,387,417	10,773,060
†Houston Lighting & Power	2,963,812	3,144,835
*Kansas City Power & Light	3,037,392	2,977,207
*National Power & Light and subs.	3,882,848	5,962,565
*New Jersey Power & Light	1,073,630	1,001,766
*Niagara Hudson Power and subs.	5,076,489	5,992,908
*Rochester Gas & Electric..	2,925,734	3,103,538
†Tampa Electric	1,266,078	1,178,629
*Union Electric (Missouri) and subs.	8,107,596	7,464,119
†Utah Power & Light and subs.	1,926,043	2,375,856
*West Penn Power and subs.	5,744,771	6,325,907

*Twelve months ended September 30.
†Twelve months ended October 31.

Colorado Public Service Will Buy Pueblo Gas Co.

Public Service Co. of Colorado will purchase the Pueblo Gas & Fuel Co. for $400,000, it was announced recently by company officials following approval of the deal by the Securities and Exchange Commission. The Pueblo operation, which supplies the southern Colorado city with natural gas, will be continued under the same name and management, it was reported.

Under terms of the purchase, Public Service company will pay $400,000, representing 3,500 shares of the Pueblo firm's $100 par value common stock, to Cities Service Power & Light Co., the parent organization, which will apply the sum to the payment of bank loan notes held by the Chase National Bank.

Energy Output Drops 0.7%

Electric energy produced for public use in September, 1944, totaled 18,468,061,000 kw.-hr., a decrease of 0.7 percent, when compared with September, 1943, according to a report issued by the Federal Power Commission. Average daily production of electric energy for public use in September was 659,574,000 kw.-hr., a decrease of 1.6 percent, when compared with the average daily production during the previous month. Production of water power in September amounted to 5,384,603,000 kw.-hr., or 29.2 percent of the total output for public use.

How

DESIGN · CONSTRUCT · OPERATE · MAINTAIN

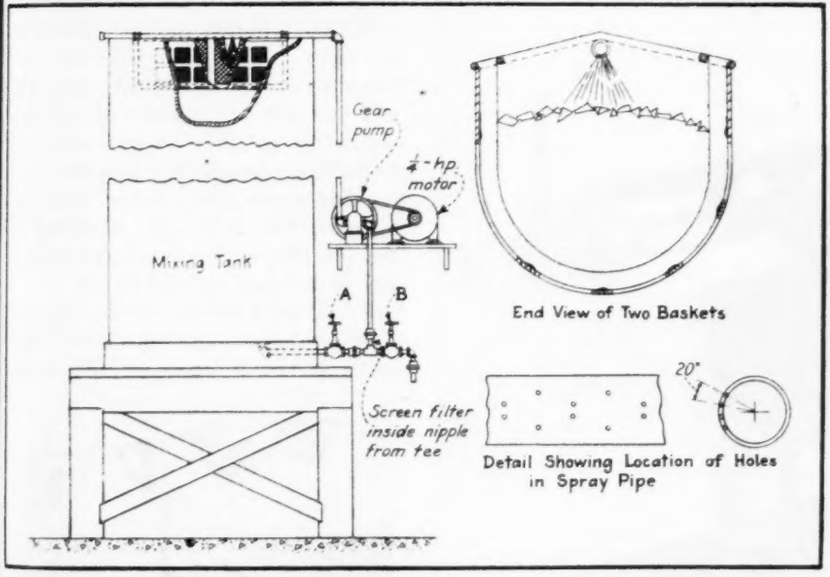
Rig for Preparing Pentachlorphenol

By E. A. STANGER
Distribution Manager, Southern Canada Power Co.
Montreal, Canada

Pentachlorphenol preservative for well-seasoned poles is prepared at a central point of the system and shipped in special containers of 20 and 45 gallons capacity to other parts of the system. The solution is made up in the following proportions for each 100 imperial gallons of oil used: 45 pounds of pentachlorphenol, 40 pounds of Synthe Copal Ester gum and 100 gallons of light diesel or domestic furnace oil of 0.82 specific gravity. The resulting 905 pounds constitutes a 5 percent pentachlorphenol mix. The oil merely acts as the vehicle to carry the pentachlorphenol into the wood. The gum serves as an anti-blooming agent to prevent the pentachlorphenol from defloorescing on the surface of the pole.

Equipment for making the mixture consists of a vertical tank in which there are two nested baskets, one with fine wire and one with coarse wire screen. They are supported by the perforated pipe from which the oil is sprayed over the contents by means of a motor-driven gear pump.

The equipment is set on a platform high enough to permit filling the shipping containers by gravity. Domestic furnace oil No. 1 or No. 2 is the best to use but any that have high aromatic content and consequent low aniline point are suitable.



OLD H. T. TRANSFORMER TANK carries two nested baskets for holding pentachlorphenol and anti-blooming agent over which oil is sprayed. Outer basket of No. 24 galvanized iron with 36 3½-in. square windows; each has 30-mesh screen soldered diagonally over the opening. Inner basket of ¼-in. mesh No. 23 galvanized screen supported by three straps of No. 24 gauge galvanized iron. Both baskets supported by perforated spray pipe

Procedure is as follows:

1. Pump into the tank the amount of oil for the batch (Valve A closed, B open).
2. Weigh out the requisite amount of pentachlorphenol (preferably in loose granular form). Dust-type respirators and masks should be worn and care taken to keep dust from blowing around.
3. Weigh out the requisite amount of gum. Reduce it to lumps about the size of store coal; if it is too fine it may cake up.
4. Charge the baskets with the solids in alternate layers. (If the basket is too small to hold all the solids for one batch the remainder can be put on after the oil has been circulated an hour or so.)
5. Start pump and circulate oil (Valve A open and B closed).
6. At ordinary temperatures the solids will be completely dissolved in 8 to 12 hours. Heating by an immersed steam coil will speed up the solution of the solids.
7. Draw off the preservative solution into the shipping containers.
8. Pump at least one barrel of fresh oil into the tank to clean the pump, spray head and screens so that the resin may not dry out and gum them up.

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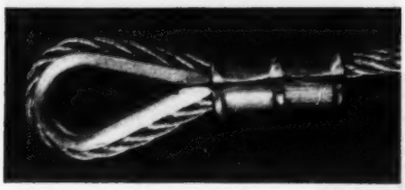
Sleeve's Lining Holds Cable Splice

A cable splicing sleeve the interior of which is coated with a brittle metal which breaks up under the crimping action and bites into the cable was recently developed by The Glenn L. Mar-



CABLE IS FED through the sleeve, looped around the thimble and back through the sleeve

tin Co., Baltimore, Maryland. It is saving more than 250 hours per week over the old method of hand splicing and wrapping, and allows inexperienced workers to perform operations which formerly required the more skilled men.

The copper sleeves are oval shaped to accommodate a double thickness of the required diameter cable, and can be used for splicing two cables together or for forming an eye loop in the end of a cable. The latter is the application that is used most generally, particularly for lanyards and other secondary cables. The sleeves are not employed on control cables where swaged fittings are now used almost universally.

The cable is fed through the sleeve, looped around the thimble and back through the sleeve in the other direction. Two different types of tools are used for crimping the sleeve—one a hand operated tool like a pair of pliers, and the other a set of dies operated by a foot lever. Tests have shown that the splice is stronger than the cable itself and the cable breaks before it slips in the sleeve.

Another advantage of the sleeve is the saving in cable. Under the old method the cable had to be cut 10 in. longer than the required length for each splice. With the present method the cable is cut exactly to length and there is no scrap.

Tank Develops Long Oscillograph Films

By A. A. MILLER
Buffalo Niagara Electric Corp., Buffalo, N. Y.

Developing tank used to develop long length of automatic oscillograph film is equipped with a number of Bakelite rolls mounted on a copper frame in such a manner that the film can be threaded around these roller guides, thereby passing it through the developing solution, into the water washing bath, through the fixing solution and again into the water bath.

An additional roller is placed near the right end of the fixing tray in such a manner that the film will pass through the fixing solution twice when properly threaded around the roller guides. The film is passed through the solution by slowly turning two of the roller guides by hand. After the film passes through the fixing solution, it is placed in the water washing bath until the entire film length has been developed. It is then wound on a spool and removed for drying.

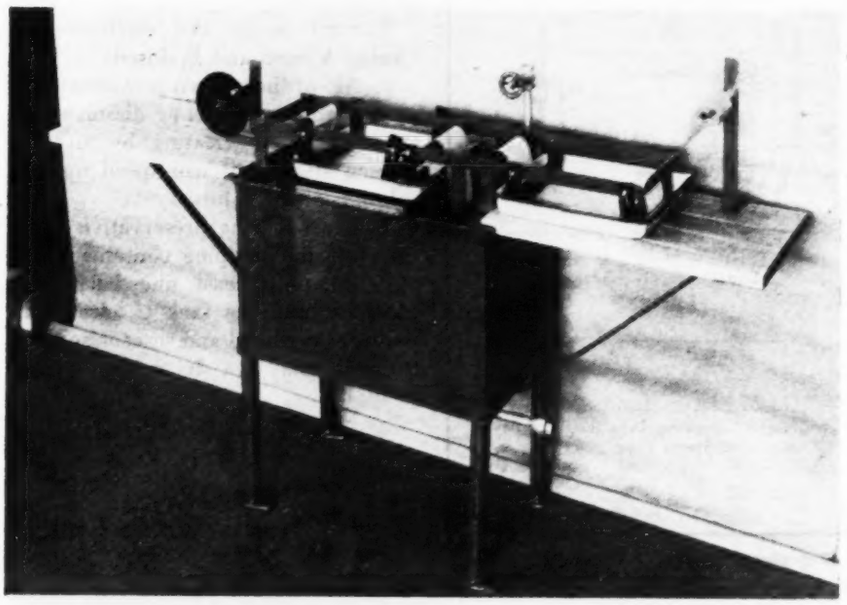
A "Brownie Safelight" model "C," equipped with a "Wratten" series "OA" lens is used while developing. A ten-watt lamp is used in the "Safelight" and is mounted about 4 ft. above the developing tank. With this type of light, the visibility is much better than with the usual red light used for developing purposes.

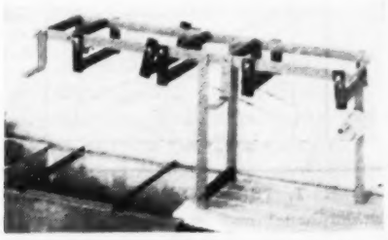
A ½-in. brass pipe is mounted inside the tank along the bottom for the water supply. This pipe has a number of small holes drilled through it to give an even distribution of water flow through the tank. A shut-off valve is mounted in the supply line to control the flow of water. An over-flow pipe is placed in the corner of the tank on the opposite side of the supply line. This pipe is also ½-in. brass and about 16-in. long in order to maintain the proper water level in the tank.

Drain Board Mounting

There is a 14-in. by 16-in. by 1-in. drain board mounted on each end of the tank; one of which is used to support the developing tray, and the other is used to mount a winding device. The winding device consists of a piece of 1¼in. bakelite rod mounted on a 6-in. bakelite disc. The rod and disc are rotated on a brass stationary spindle which is fastened to the drain board. Wet film is wound on this spool after it has been developed. This makes the handling of the wet film more convenient until it has been hung up and dried.

Trays used for the developing and fixing solutions are porcelain lined metal used for photographic work.





DEVELOPING TANK (left) of 20-gauge rolled sheet copper reinforced around top edges with ¾ by ⅛-in. angle brass and placed on angle iron frame supported by 1¼-in. pipe legs is used for developing and fixing oscillograph films: (right) gives details of copper framework which support the Bakelite rolls

Method of Cutting-over 2,300 Δ to 4,000 Y—I

1—Planning*

By J. J. BURRI,
Superintendent of Distribution
Staten Island Edison Corp., Staten Island, N. Y.

A method of changing 2,300-volt delta primary distribution system to 4,000-volt wye was recently used which, due to careful planning, allowed the work to proceed with no customer complaints due to outages. In planning the change the system was divided into three geographical divisions which could be operated independently of one another and still maintain continuity of service in case of emergency.

Only one section was converted to 4,000-volt wye operation at a time and each section was treated as a separate project. All necessary extensions of wire, changes in connections and other necessary work pertinent to the cut-over were indicated on maps prepared for each circuit. These maps beside being used for the preliminary work were also used during the actual cut-over.

Provide Neutral Grid

The first step to be completed was to establish a neutral grid. This was accomplished by the extension of wire where necessary for the neutral, and the conversion of existing wire to a neutral. The wires which were converted to neutral were generally one of the phase wires of the street light feeder circuits which parallel the primary distribution circuits. In some cases one of the phase wires of a three-phase branch distribution circuit was converted to neutral when the load was not sufficient to warrant the extension of a neutral wire. In these cases any three-phase load can be supplied by two transformers connected to the two phase wires and the neutral with the secondaries connected in open delta. Also one wire of all single phase branch circuits was converted to neutral. The neutral wire in all cases was identified by the use of white insulators for support.

At the same time the preliminary work was being done on the overhead lines, the crews were installing the neutral bus in the substations, reconnecting the potential transformers for metering in the truck switches, installing an additional regulator in the regulated circuits, running a neutral wire in underground cable conduits to customer's vaults and installing a neutral bus in customer's vaults. All this preliminary work was accomplished without interruption to the customers.

* First of a series of three articles

Kill, Transfer, Then Thaw 13.2-Kv. Line

By SAM W. DAVIS
District Engineer, Southwestern Public Service Co., Amarillo, Tex.

To thaw glaze on a 13.2-kv. line experience has proven it expedient to shift that circuit to the auxiliary bus, short circuit it, and energize it with a separate generator to start the melting process. The most practical condition to attempt to obtain is about a 50 to 55 deg. C. temperature rise in the conductor. Success of this procedure is dependent upon the whole operating department having full and complete knowledge of the procedure so that it can be carried on with speed and efficiency.

In the actual thawing process all outgoing 13.2-kv. circuits are shifted to the main station bus, except the circuit to be deglazed. Then the thawing generator (5,000-kw., 13.2-kv.) and the circuit to be de-iced are placed on the auxiliary bus. The circuit to be thawed is then opened and short circuit jumpers are applied at some predetermined point on the

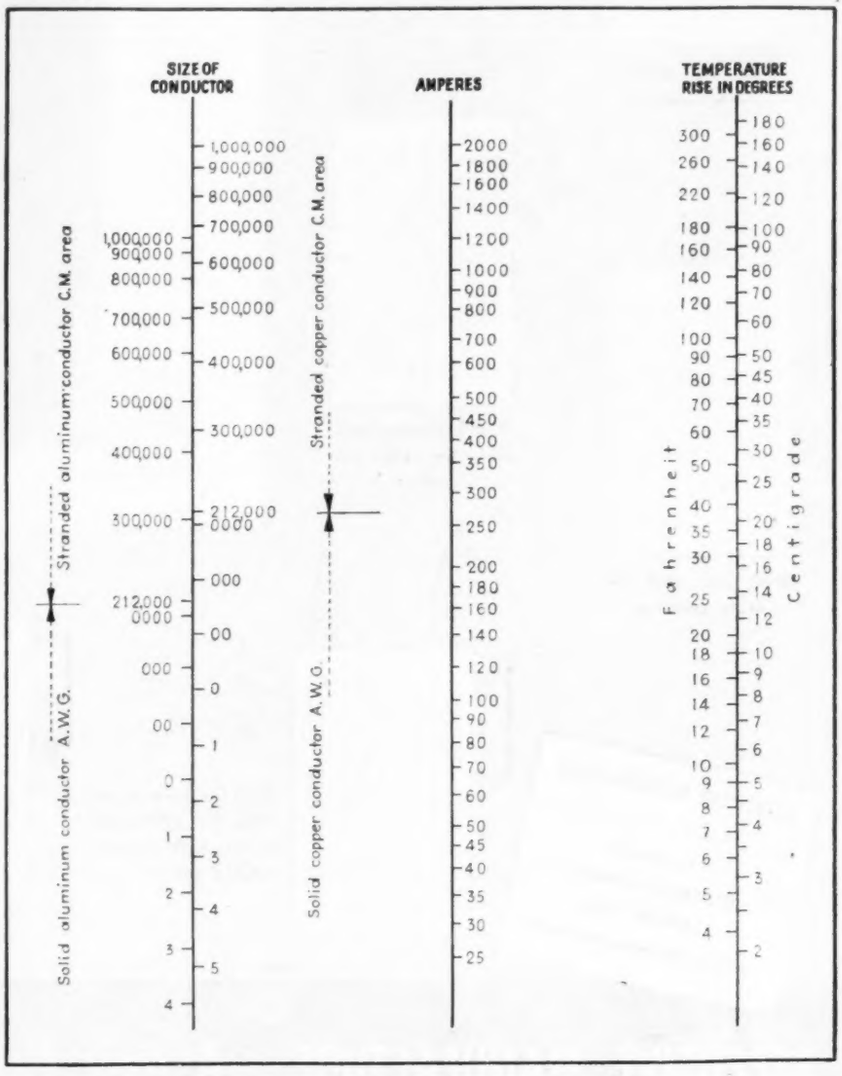
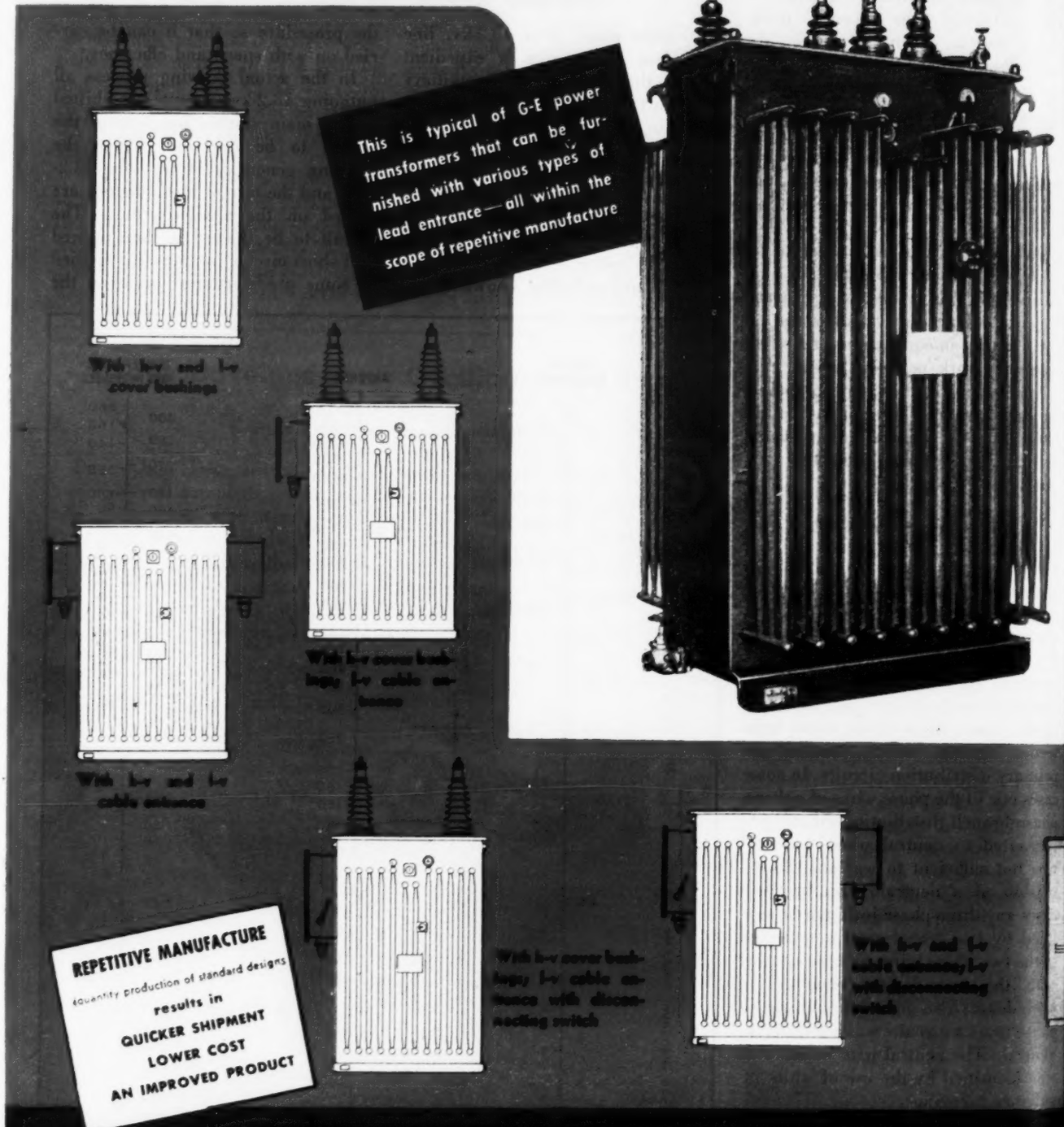


CHART FOR DETERMINING current carrying capacity of bare wire suspended in still air temperature, rises taken into consideration

See what a wide variety of

can be met with REPETITIVE-


This is typical of G-E power transformers that can be furnished with various types of lead entrance—all within the scope of repetitive manufacture
With h-v and l-v cover bushings
With h-v cover bushings, l-v cable entrance
With h-v and l-v cable entrance
With h-v cover bushings, l-v cable entrance with disconnecting switch
With h-v and l-v cable entrance, l-v with disconnecting switch
REPETITIVE MANUFACTURE
Quantity production of standard designs
results in
QUICKER SHIPMENT
LOWER COST
AN IMPROVED PRODUCT

REPETITIVE MANUFACTURE—A New Field for Co-operation

conditions

MANUFACTURE POWER TRANSFORMERS

REPETITIVELY manufactured power transformers offer great flexibility as to methods of installation, as evidenced by the various lead entrances and the combinations into unit substations, shown. Also, repetitive-manufacture transformers can be used on many jobs where "specials" have heretofore been considered necessary, such as parallel operation and delta operation with transformers already installed.

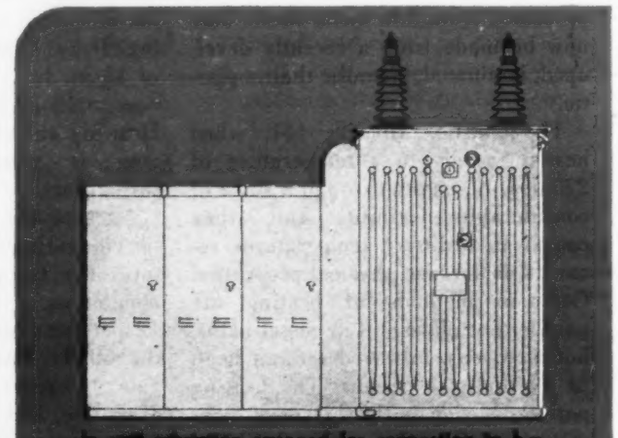
By proper selection, an RM-listed unit can be used to take care of load fluctuations, load growth, heavy short-time overloads, voltage drop, and conditions requiring low-temperature rise, etc. (For example, a 2500-kva, 55 C RM-listed transformer will have the thermal characteristics of a *special* 2000-kva, 40 C transformer, and at a *lower* price.)

To make the repetitive-manufacture program a success, we need your co-operation in studying each of your applications carefully, and specifying *standard* units wherever possible. Naturally, every transformer rating cannot be included in our repetitive-manufacture line. At present, RM listings cover step-down transformers for use on standard circuits of 2400 to 66,000 volts, in single-phase designs from 667 to 5000 kva, and in three-phase designs from 750 to 10,000 kva. Transformers of other than RM-listed ratings can, of course, still be obtained.

Repetitive manufacture will release our research and design staffs to concentrate on improving the line as a whole rather than continually working out detail modifications in design to meet the specifications of each new order.

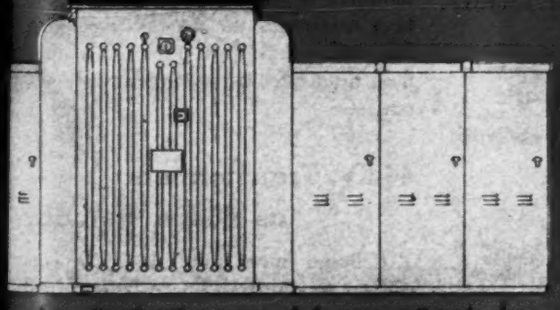
For descriptive information RM-listed transformers, ask for the booklet offered below. It includes full details of terminal arrangements, standard accessories, and optional features that are available. *General Electric Company, Schenectady 5, N. Y.*

Buy all the BONDS you can — *and keep all you buy*

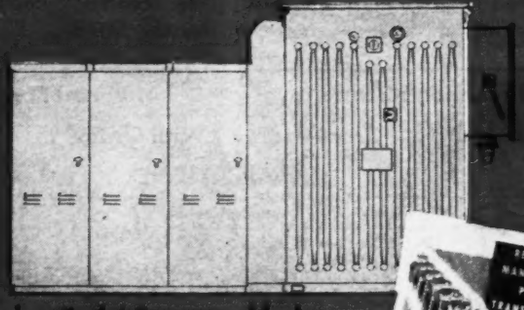


In unit substation arranged for connection to h-v overhead line

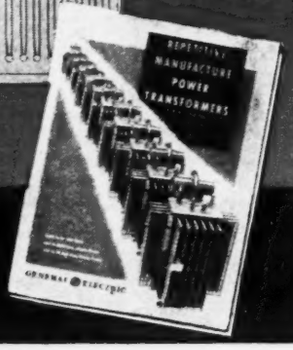
THIS TRANSFORMER IS ALSO A COMPONENT OF RM-LISTED MASTER UNIT SUBSTATIONS



In unit substation arranged for connection to h-v circuit breaker



In unit substation arranged for h-v cable entrance with disconnecting switch



GENERAL ELECTRIC

Ask for your copy of this booklet on RM-listed transformers, GEA-4283

circuit. The circuit is closed and voltage and current are gradually built up. In most cases the full load current of the generator is reached before the maximum voltage is obtained, and to attempt to bring the voltage up to 13.2 kv. in such cases would result in burning up the machine. There are, however, on our system a few places where the voltage is the limiting factor and thereby determining the greatest length of line that can successfully be so treated.

Starting with 150 amp., the build up within the limits of safety is approximately 50 amp. increase per each 10 min. lapse of time. In this manner it takes about 30 min. to bring the current up to ice melting values of 240 to 250 amp. on No. 1/0 copper conductor. This is readily determined from the accompanying chart.

The generator OCB, as a safety precaution, should have overcurrent relay protection, for there is always the possibility of the line burning down due to high currents, high resistance connections, or strands of the conductor having been broken or shot away. Such reduced cross sections will carry normal load currents without excessive heating but during deicing may burn down.

Heated Thermoplastic Drawable Like Steel

By Dr. E. R. PERRY
Manager, Micarta Department
Westinghouse Electric & Manufacturing Co.
East Pittsburgh, Pa.

Parts formerly drawn, formed or processed from thin metal sheets may now be made from a recently developed, laminated, phenolic thermoplastic.

The plastic, Micarta 444, when heated rapidly to a temperature of 275 deg. F., passes through a stage of considerable flexibility and when cooled to ordinary temperatures recovers its average physical properties. Common methods of heating are parallel hot plates, oil or metal baths, hot air ovens, infra-red radiant heat, or by dielectric means. The heating period depends on the thickness of the material. When the proper flexibility is reached (275 deg. F.) the material may be bent to an angle of not more than 90 deg. without splitting, blistering, cracking or delaminating. At this stage it may also be drawn without cracking, wrinkling or delaminating. Draw limits range from a depth of $1\frac{3}{8}$ in. for $\frac{1}{32}$ of an inch of thickness to $1\frac{1}{4}$ in. for $\frac{1}{16}$ in. of thickness. Drawing and shaping without a draw ring is possible, indicating its formability.

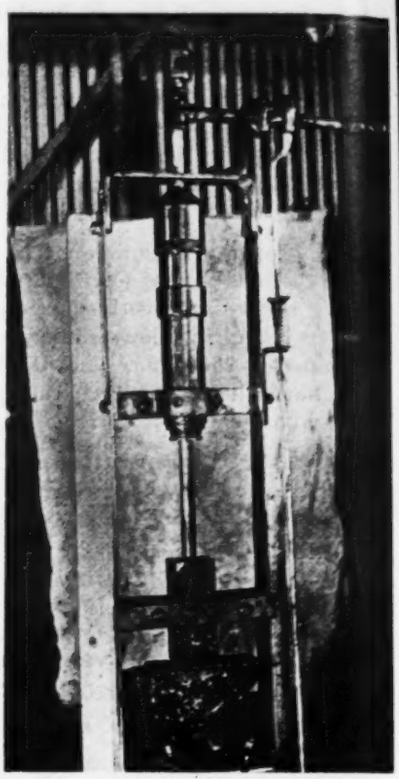
Micarta 444 in tan has greater tensile elongation at the forming temperature. The tan grade has an ultimate elongation of 10 percent lengthwise, 12 percent crosswise, and 40 percent diagonally. Dark green 410 will elongate 9 percent lengthwise, 9 percent crosswise, and 25 percent diagonally.

Properties' data are average values based on tests made by A.S.T.M. method. Samples were tested in the "as received" condition at approximately 70 deg. F.

444 Forming Micarta			410 Semi-Forming Micarta	
With Grain	Cross-Grain	PROPERTIES	With Grain	Cross-Grain
13,000	11,000	Tensile Strength	13,000	11,000
0.9×10^6	0.9×10^6	Modulus of Elasticity	1.1×10^6	1.1×10^6
19,000	16,000	Flexural Strength Flatwise	24,000	18,000
19,000	16,000	Flexural Strength Edgewise	24,000	18,000
2.9	2.3	Izod Impact Str. Flatwise Ft. Lbs./1" Width	6.0	5.0
1.3	0.7	Izod Impact Str. Edgewise Ft. Lbs./1" Width	3.0	2.0
33,000		Compressive Strength Flatwise		37,000
16,000		Compressive Strength Edgewise		20,000
240 Volts/Mil		Dielectric Strength Short Time		200 Volts/Mil
130 Volts/Mil		Dielectric Strength Step by Step		100 Volts/Mil
1.37		Specific Gravity		1.39
		Water Absorption (A.S.T.M.)		
6.0		3 x 1 x 1/16 (Weight gain in 24 hours.)		4.5
(Approx.) 0.00061 Cal./sec./°C/sq.cm /cm		Thermal Conductivity		(Approx.) 0.00061 Cal./sec/°C/sq.cm/cm
(Approx.) 0.4		Specific Heat		(Approx.) 0.4
(Approx.) 31×10^6 per °C.		Thermal Coefficient of Expansion		(Approx.) 31×10^6 per °C.

Forge Hammer Made from Pneumatic Tamper

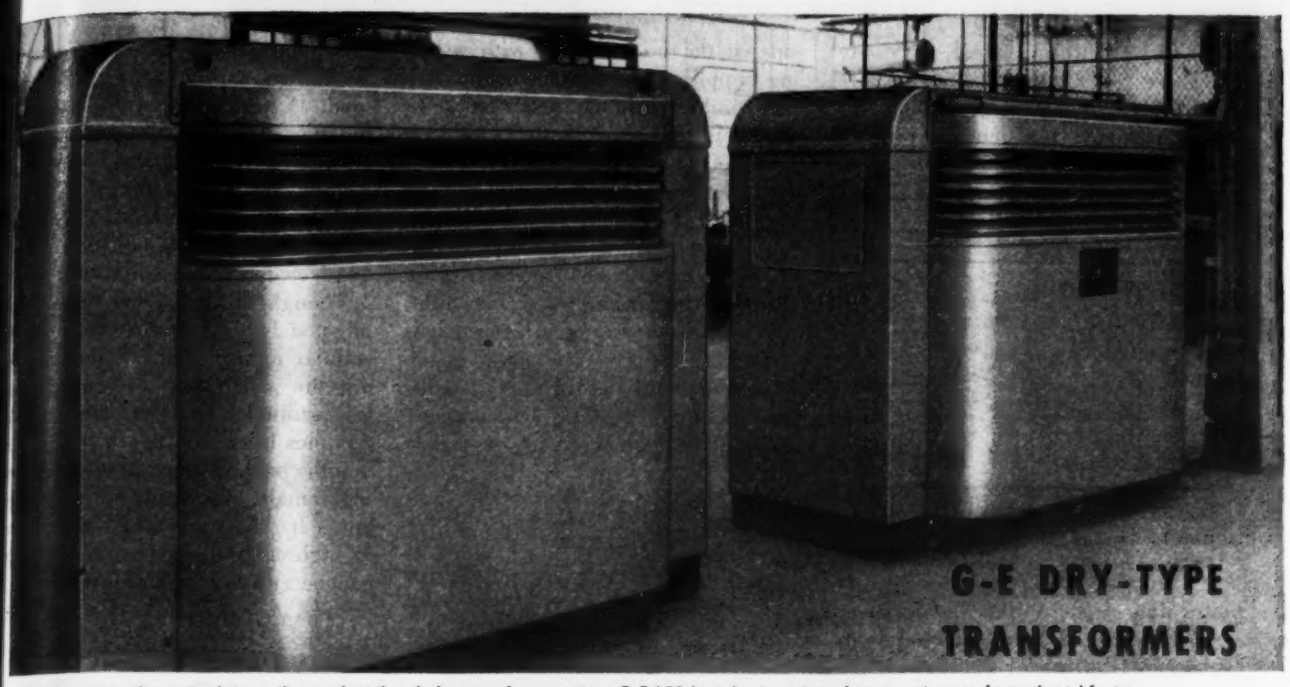
Lack of a helper due to wartime labor shortage proved the necessity for invention by G. H. Peterson, of Pacific Gas & Electric Co. general shops at Davis, Calif. By adapting a used Chicago pneumatic tamper, a light forge hammer was constructed as illustrated. Use of this mechanical hammer in the blacksmith shop cuts to a minimum the necessity of forging with a hand hammer. It is operated by air from the shop supply system.



PNEUMATIC TAMPER mounted in suitable angle iron frame provides useful forge hammer in utility shops

44-Kv. Transformers as 66-Kv. Standby

It being impossible under war conditions to obtain a spare transformer for an important substation on the system of the East Tennessee Light & Power Co., recourse was had to what was at hand to provide standby capacity. The main unit of the substation is a 3,600-kva. transformer stepping down from 66 kv. to 2,300 volts. As this transformer is the principal supply for the city of Bristol, a stand-



As up-to-date as the product they help manufacture—two G-E 150-kva dry-type transformers at a newly equipped factory

6 UNIQUE FEATURES

set new standards for dry-type designs— in safety, ease of installation, appearance

1 A case designed for utility, that is attractive in appearance.

2 Completely metal-enclosed construction that prevents rods and wires from being accidentally pushed into live parts of the transformer.

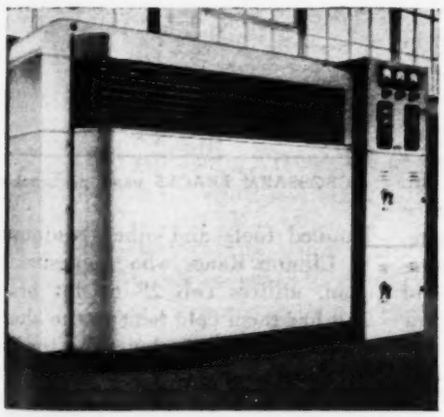
3 No exposed live parts, such as bushings, that would neccesitate enclosing the unit with a fence to protect personnel.

4 Cable terminal compartments completely removable, so that the high-voltage and low-voltage cables can be made up and the unit then slid into place between them without the use of a crane or elaborate hoisting and jacking facilities.

5 Readily removable casing to facilitate inspection and cleaning of the core and coils.

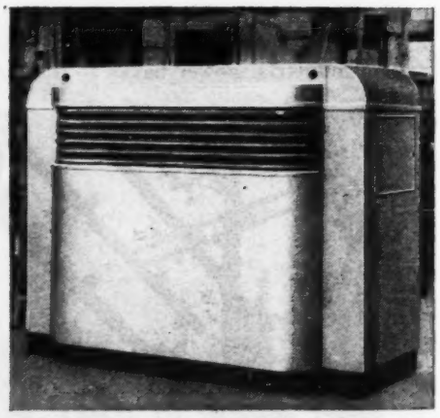
6 Transformers equally suitable for top or bottom connection. Can be equipped with a high-voltage pothead, if desired. Low-voltage terminal facilities are suitable for either cable or bus-duct connections.

These ultramodern distribution transformers are designed to meet AIEE Standards No. 1 for Class B insulation, with 130 C maximum hot-spot temperature in a maximum ambient of 40 C, resulting in an average temperature rise of approximately 65 C. They are now available for use on 601- to 15,000-volt primary circuits, in ratings from 100 to 2000 kva. For further details ask for Bulletin GEA-3714B. General Electric Company, Schenectady 5, N. Y.



Dry-type load-center unit substations are also available. This 750-kva unit steps down 2400 volts to 480 volts at a Southern metals plant.

H-v and l-v terminal compartments are easily removed. They eliminate the hazards of exposed bushings and wiring.



Transforms 2400 volts to 575 volts for machine tools and other factory loads at a New England plant.

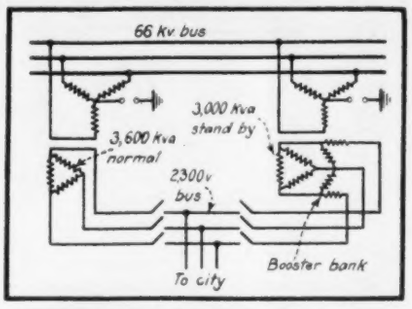
GENERAL ELECTRIC

BUY WAR BONDS

402-67-5100

by for it was a real necessity.

Three 1,000-kva. transformers, rated 44/2.3 kv. were available. They were arranged for neutral-grounded Y connection to the 66-kv. line, thus affording capacity that, under temporary overload, could carry the city in case of failure of the main transformer. Since the voltage to neutral of a 66-kv. Y is 38 kv., the secondary potential of the 44-kv. transformers thus connected is just under 2,000 volts. This potential is brought up to the distribution level by using two 2300/450 volt distribution transformers as boosters.



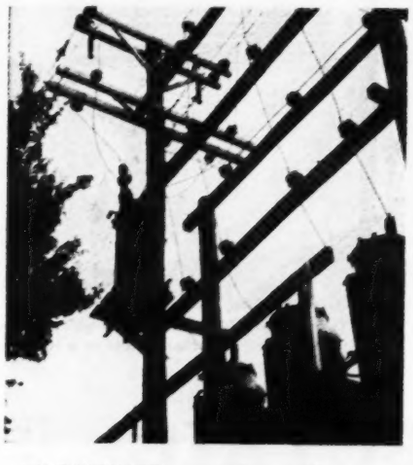
SECONDARY BOOSTERS allow 44-kv. transformers to act as spare units in 66-kv. substation in Bristol

Although their insulation value is less than normal for a 66-kv. transformer, the bushings on the 44-kv. units were not changed. It was felt that if trouble came, a bushing flashover was preferable to a burnout.

•

Pole-Mounted Metering Outfit

Self-contained primary metering outfits like the one at upper left, when mounted on a separate pole platform make it possible to confine bus work at industrial power banks to the load side of the transformers with resulting simplification of the installation. The outdoor primary metering outfit shown is associated with a 450-kva. 13.8/460-volt delta-connected power bank serving an industrial plant on the Central Illinois Electric & Gas Co. system at Rockford. Both potential and current transformers are contained in the primary metering outfit. This mounting arrangement which is standard on most large power installations in the Rockford area, was designed by J. J. Graven, company distribution engineer.



POLE-MOUNTED metering outfit

•

Thermal Insulator that Appears to Grow

By DR. J. J. PYLE

Director of Plastics Laboratory
General Electric Co., Pittsfield, Mass.

A new type of thermal insulating material called Texolite Foam has been developed that appears to grow by itself. This material, lighter than rock wool, glass or cork, has a lower thermal conductivity than any one of the three.

It is made by activating a liquid resin so that it foams to a light cellular mass many times its original volume. As such it offers unique forming opportunities that have never been previously available in thermal insulators. Volumes as large as 50 cu. ft. have been completely filled by this rigid foam, simply by introducing the activated liquid resin and allowing it to expand. The transition from a liquid to a cured foam requires only minutes and no application of heat is necessary.

Besides its ability to be formed in place, it has excellent thermal insulating properties. The following table compares the density (lbs./cu. ft.) and thermal conductivity (B.t.u.'s per hour per sq. ft. of area per in. of thickness per deg. F. difference between the two faces) of this material and other common insulating materials that are available in rigid or semi-rigid form.

	lb./cu. ft.	"K"
Glass wool	4	0.26
Rock wool	6	0.27
Cork board	7	0.28
Fibre board	18	0.34
Hair felt	9	0.26
Textolite foam	2	0.24

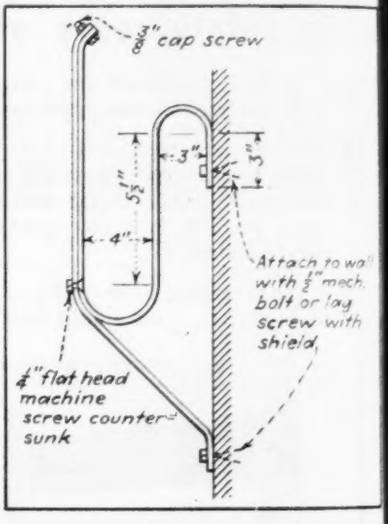
It has been produced in a range of densities which have a direct bearing on its mechanical strength. The lightest weight foam, weighing approximately 2 lb. per cu. ft., is not intended to support any appreciable load. A higher density foam, weighing approximately 7 lb. per cu. ft., has a compressive strength of 140 psi and is sufficiently strong to function as a structural material. The foam will not support combustion and is unaffected by most solvents.

Though the expanded resin is not affected by immersion in water, the cellular nature of the foam will permit the penetration of moisture unless suitable barriers are utilized. Samples immersed in water for three months without any protective coating remain afloat and are still buoyant. It will withstand temperatures as high as 200 deg. C. and all grades can be cut with a knife or saw.

•

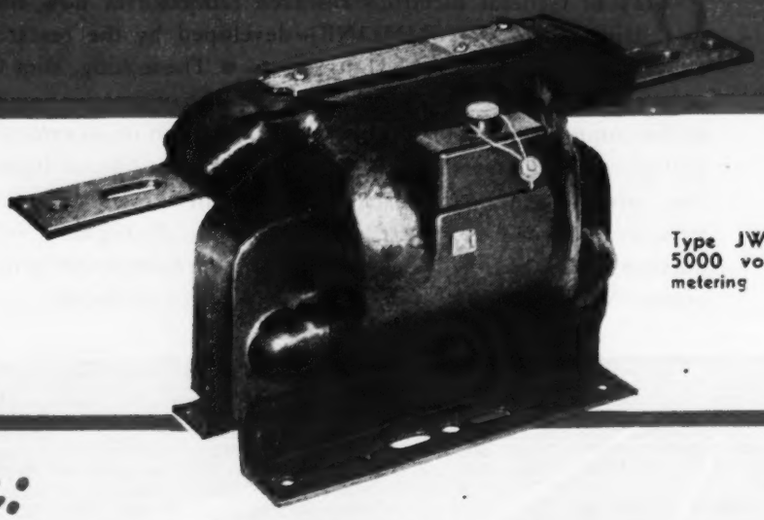
Salvaging Old Crossarm Braces

Worcester County Electric Co., Worcester, Mass., a New England Power subsidiary, salvages discarded crossarm braces for bracket use in the storehouse for the support of coils of wire returned from the field, long-handled tools and other equipment. G. Clinton Rand, who suggested the plan, utilizes two 28-in. flat braces and has them cold bent to the shape illustrated, for attachment to the wall by bolt or lag screw with shield. The main hook is formed in an S-shaped section, 4-in. wide at the material supporting area. A second brace is bent into a long diagonal to support the hook and its weight, the two being fastened together by cap and machine screws.



CROSSARM BRACES used as brackets

Question: What's the accuracy classification of this instrument transformer?



Type JW-1 current transformer, 5000 volts, for high-accuracy metering

Answer:

ASA Burden	B-0.1	B-0.2	B-0.5	B-2
ASA Accuracy Class	0.3	0.3	0.3	0.3

This means that with standard **ASA** burdens, the ratio correction factor and the transformer correction factor will be within the limits of the ASA accuracy class 0.3.

NEMA Burden	X	Y	Z
NEMA Accuracy Class	¼	¼	¼

This means that with standard **NEMA** burdens, the ratio error and the phase-angle error will be within the limits of the NEMA ¼ accuracy class.

How Accuracy Classification Helps You

IN the selection and application of instrument transformers, a thorough knowledge of the new ASA system of accuracy classification can help a great deal.

For example, different applications often require different transformer characteristics. A transformer that is satisfactory for metering purposes (highest accuracy up to 100 per cent of its current rating) may not be satisfactory for relaying purposes where the *overcurrent* characteristics (currents as much as 20 times normal) must be considered.

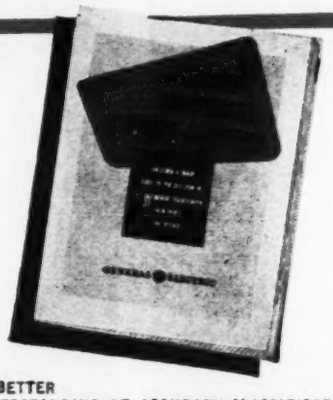
The new ASA accuracy standards have made possible the most precise method of selecting instrument transformers yet devised. All G-E instrument transformers are classified in accordance with these standards.

This enables you to select the transformer with the most suitable characteristics for the job to be done. *General Electric Company, Schenectady 5, N. Y.*

BUY ALL THE BONDS YOU CAN—*KEEP ALL THE BONDS YOU BUY*

GENERAL ELECTRIC

604-13-6400



FOR A BETTER UNDERSTANDING OF ACCURACY CLASSIFICATION

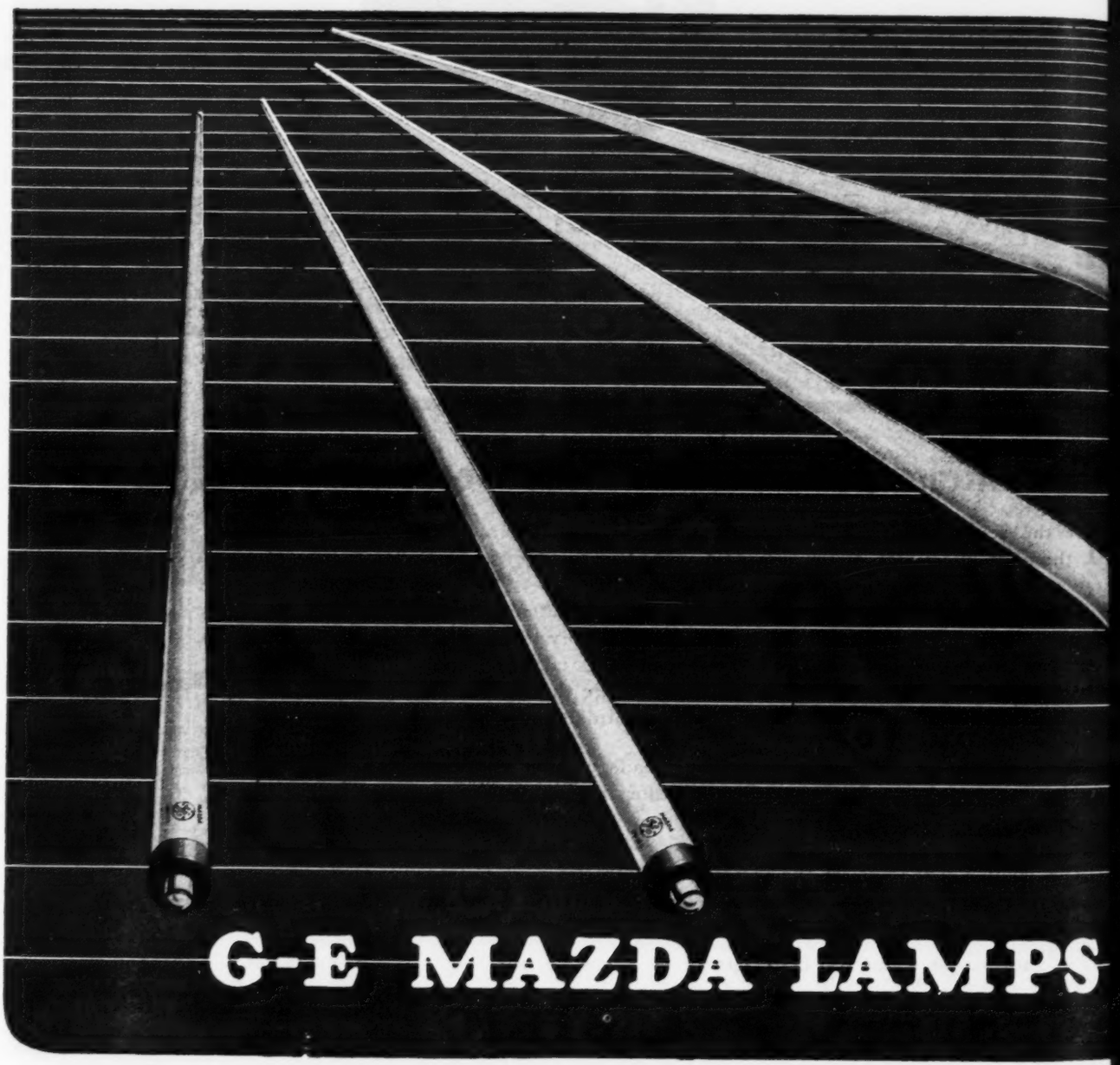
This publication explains the ASA accuracy standards for current and potential transformers and shows how they differ from the NEMA standards. Also, you will find this booklet a handy guide to the selection of G-E instrument transformers. Ask for your copy today. Address the G-E office nearest you.

HEADQUARTERS FOR ELECTRICAL MEASUREMENT

ANOTHER PRODUCT OF GENERAL

NEW G-E SLIMLINE

OUT of General Electric's research laboratories now come four new fluorescent lamps—the G-E SLIMLINE—developed by the research organization that has originated so many other lighting firsts. ● These long, slim G-E Fluorescent Lamps—up to eight feet in length—will inspire a wealth of creative new lighting effects, especially in the commercial field, at a cost within the reach of an extensive lighting market. They will stimulate the trend to long slim lines of soft, diffused light . . . for general illumination, cove lighting and showcases. They will expand the opportunities for combining attractive new decorative effects with substantially higher levels of illumination. ● Production of G-E SLIMLINE Mazda Fluorescent Lamps will proceed as fast as conditions permit. We will inform you as soon as they are available.



G-E MAZDA LAMPS

ELECTRIC LAMP RESEARCH

FLUORESCENT LAMPS!

G-E SLIMLINE Mazda Fluorescent Lamps offer advantages never before combined in any fluorescent lamp:

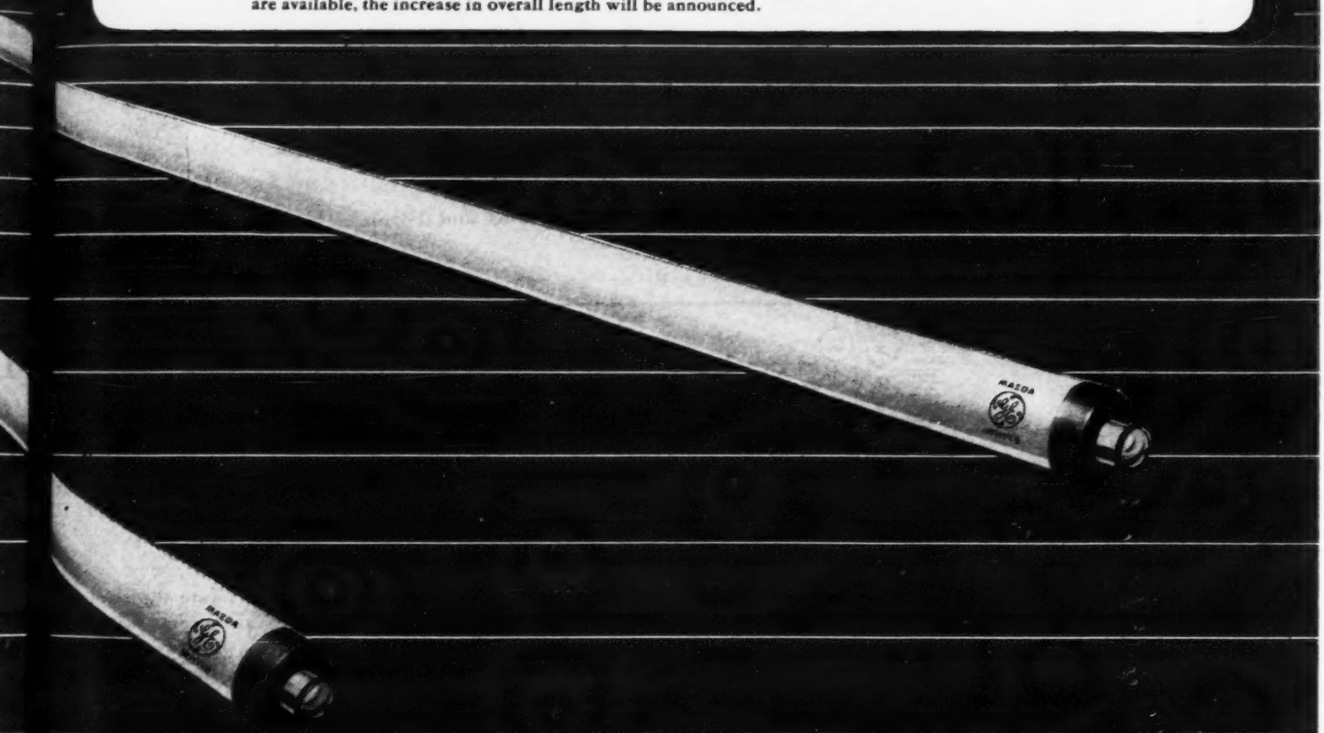
(1) slim lines of light for new effects
(2) higher efficiency—average of 60 lumens per watt
(3) instant starting, without starters
(4) long life
(5) operation singly, in multiple or in series
(6) single pin base—makes possible a safe design of lamp and socket for multiple or series operation
(7) operation over a range of wattages and current values—100 to 200 milliamperes.

GENERAL ELECTRIC SLIMLINE MAZDA FLUORESCENT LAMPS

Lamp		Current (Milliamperes)	Lumens (Approx.)
42T6	Nominal Length *42" Outside Bulb Diameter ¾"	100	900
		200	1400
64T6	Nominal Length *64" Outside Bulb Diameter ¾"	100	1400
		200	2150
72T8	Nominal Length *72" Outside Bulb Diameter 1"	100	1400
		200	2350
96T8	Nominal Length *96" Outside Bulb Diameter 1"	100	1950
		200	3300

Standard 40-watt F lamp, shown for comparison

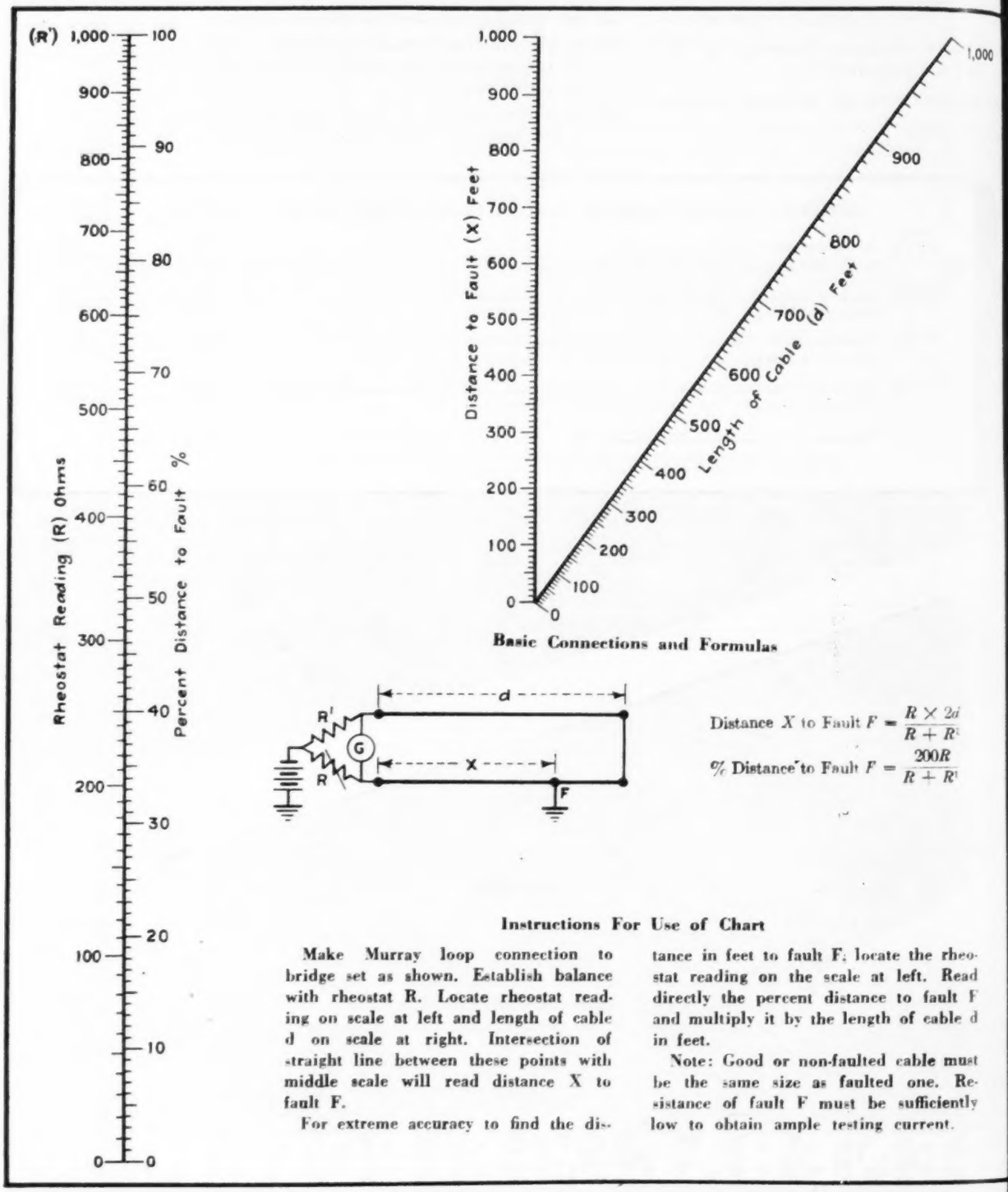
*Nominal length includes one lamp plus two multiple sockets. When series sockets are available, the increase in overall length will be announced.



GENERAL ELECTRIC

NOMOGRAPH AIDS IN LOCATING CABLE FAULTS

By RICHARD HOELLER, Meter Laboratory, Florida Power & Light Co., Miami, Fla.



Basic Connections and Formulas

Distance X to Fault $F = \dfrac{R \times 2d}{R + R'}$

% Distance to Fault $F = \dfrac{200R}{R + R'}$

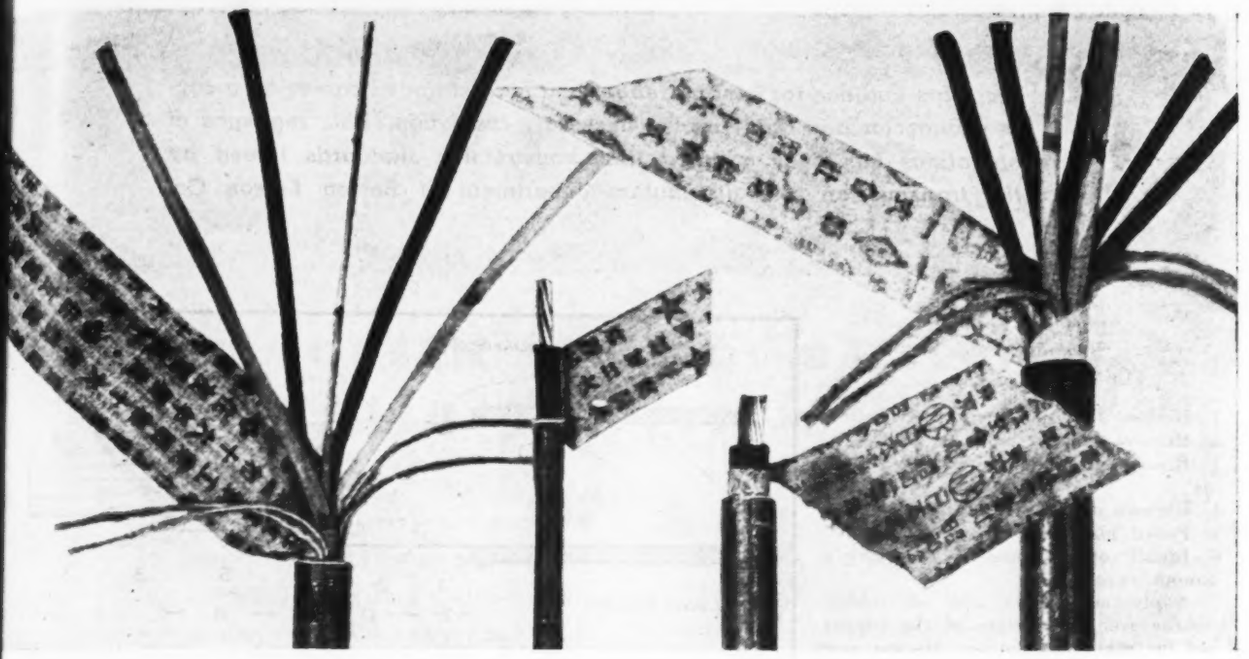
Instructions For Use of Chart

Make Murray loop connection to bridge set as shown. Establish balance with rheostat R. Locate rheostat reading on scale at left and length of cable d on scale at right. Intersection of straight line between these points with middle scale will read distance X to fault F.

For extreme accuracy to find the distance in feet to fault F, locate the rheostat reading on the scale at left. Read directly the percent distance to fault F and multiply it by the length of cable d in feet.

Note: Good or non-faulted cable must be the same size as faulted one. Resistance of fault F must be sufficiently low to obtain ample testing current.

Found: - On the Road to Tokyo ... Insulated Wires and Cables



These are not Simplex cables. They are not cables you would care to buy or use. They were picked up by one of our own men on the "road to Tokyo" and probably were "Made in Japan." They are of interest solely because they are enemy cables used by the Japanese while they occupied the Solomon Islands.

The cables in which we are more interested are the ones that you will need to carry out your postwar plans. Specially designed cables will be your best buy wherever you have unusual installation hazards or operating conditions. In writing specifications for such cables our long experience can be of help to you.

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Simplex WIRES and CABLES

CONSTRUCTION OF DUCT SPLICE FOR 600-VOLT, R. AND L. STRANDED CABLE

Steps are outlined for jointing rubber and lead stranded cables by a copper connector and applying the necessary insulation. This sequence of operations has been adapted from construction standards issued by the transmission and distribution department of Boston Edison Co.

Steps for Splicing Stranded Cable

1—Remove lead sheath and leave belled.
2—Remove binding tape.
3—Remove insulation to expose stranding.
4—Remove outer layer of strands.
5—Pencil insulation.
6—Install copper connector and make a smooth sweat.
7—Apply one heavy coat of rubber cement over the surface of the copper and the rubber insulation. Do not coat the binding tape.
8—When the cement is tacky, apply ozone resisting rubber tape to the level of the original insulation.
9—Apply two layers of varnished cambric tape. Extend this tape to and under the bell of the lead sheath. Tap the bell of the lead sheath down in place. Note: If the cable has a heavy braid under the lead sheath, apply one ring of thin copper tape under the joint between the lead sheath and the lead sleeve. This will prevent the impregnation from boiling through the split during the lead burning process.
10—Apply the lead covering and lead burn in place.

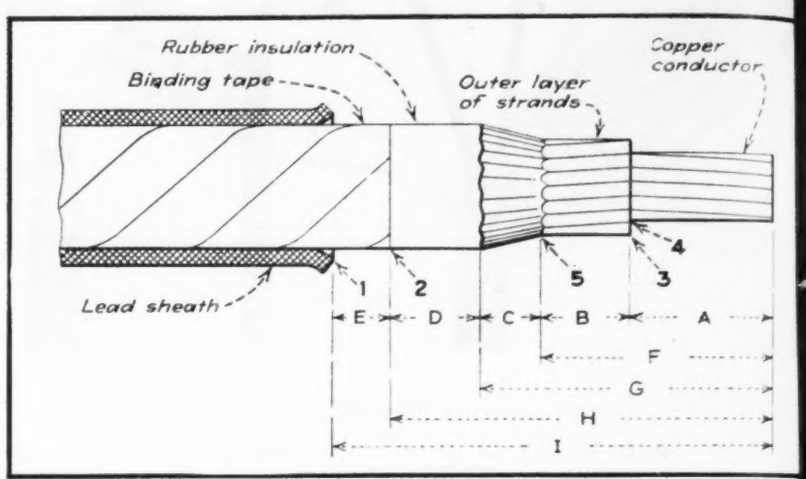


Fig. 1—Preparation of cable ends

DIMENSIONS (Inches) FOR FIG. 1

Cable Size	A	B	C	D	E	F	G	H	I	Copper Connector
1500 Mcm.	2¼	1	¾	1	½	3¼	4	5	5½	1000 Mcm.
1000 Mcm.	1½	1	¾	1	½	2½	3¼	4¼	4¾	500 Mcm.
500 Mcm.	1¼	⅝	½	¾	½	2	2½	3⅛	3¾	4/0
350 Mcm.	1	⅝	½	¾	½	1¾	2¼	3	3½	2/0
4/0	1	⅝	½	¾	½	1¾	2¼	3	3½	No. 1
1/0	1	⅝	½	¾	½	1¾	2¼	3	3½	No. 4 Solid

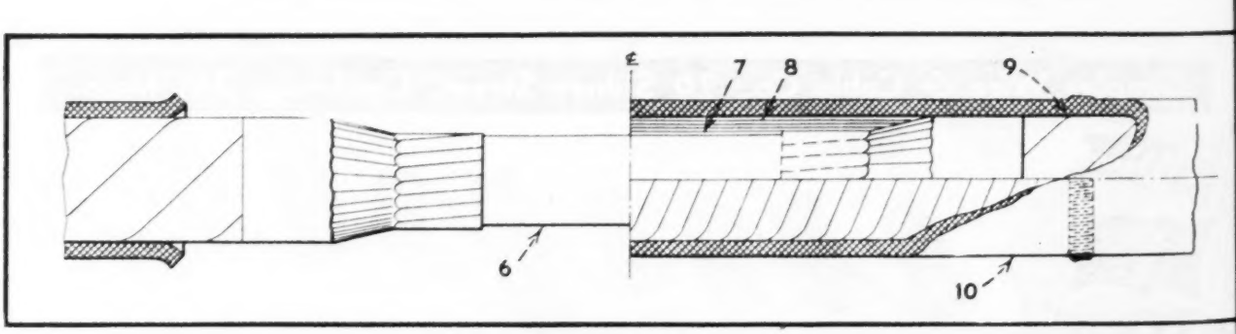
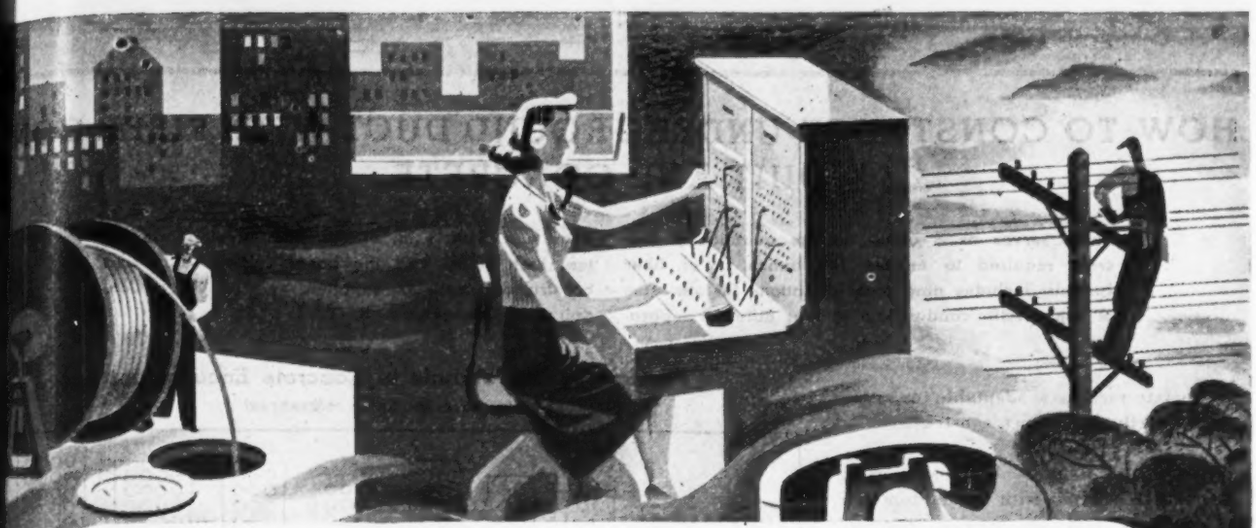


Fig. 2—Jointing rubber and lead stranded cable



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HOW TO CONSTRUCT UNDERGROUND DUCT WITH FIBER CONDUIT AND CONCRETE

Table serves as a guide for the quantity of concrete required to encase 100 trench ft. of fiber conduit; includes nine duct formations for six sizes of non-metallic conduit laid at four different separations and with 3 in. of concrete envelope on the top, both sides, and the base. Tabular data and construction methods supplied by The Fibre Conduit Co., Orangeburg, N. Y.

Concrete yardage is adaptable for either of two methods of duct construction.

1. Built-Up Method—A self-supporting structure is erected with the bottom tier of conduits laid on pre-cast concrete separators and the required number of tiers placed in position before the concrete is poured. Grooved spacers designed for one, two, three, or four conduit wide assemblies are placed in a horizontal position only and establish vertical and horizontal separation of the ducts, or rectangular spacers may be used and it is necessary to place them for both vertical and horizontal separation.

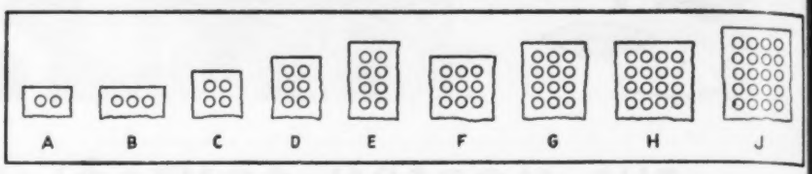
The conduit structure is tied and braced to maintain accurate position of the ducts while the concrete is being poured. A deflecting steel trough is generally used to direct the flow of the concrete alongside the structure to the bottom and up through the duct assembly, to prevent any displacement of the structure during pouring of the concrete and to aid in eliminating voids in the concrete. A spatula also helps to eliminate voids when it is worked carefully up and down between each vertical line of ducts.

2. Tier-by-Tier Method—On the bottom of a graded trench a foundation of concrete is placed. Upon this concrete base the ducts forming the bottom tier are laid and their horizontal separation is maintained by wooden or metal combs placed 3 to 5 ft. apart. Teeth of the comb are as wide as the specified separation between ducts and the crossbar of the comb is as thick vertically as the specified vertical separation of the ducts. Space between the ducts of the first tier is then filled with concrete and the ducts covered to the top of the comb separators which are then removed for use on succeeding tiers of ducts.

This method of laying conduit is repeated tier by tier until the required multiple of ducts has been laid. Concrete is mixed comparatively dry to insure a firm bed for installing each tier.

Formations of Conduits in Concrete Encasements

(Letters are for table references)



Cubic Yards of Concrete for 100 Trench Ft. and 3 in. of Fiber Duct Encasement

Fiber Conduit Size, in.	Duct Formation								
	A	B	C	D	E	F	G	H	J
	Number of Ducts								
	2	3	4	6	8	9	12	16	20
	1-in. Separation of Conduit								
2	2.4	3.1	3.3	4.1	4.9	5.1	6.1	7.3	8.5
3	3.0	3.9	4.2	5.3	6.4	6.7	8.1	9.8	11.3
3½	3.3	4.2	4.6	5.9	7.2	7.4	9.1	11.0	12.9
4	3.6	4.7	5.0	6.5	7.9	8.3	10.1	12.2	14.3
4½	3.9	5.1	5.5	7.1	8.7	9.2	11.3	13.6	16.0
5	4.2	5.5	6.0	7.8	9.6	10.0	12.2	15.0	17.8
	1½-in. Separation of Conduit								
2	2.6	3.3	3.6	4.6	5.7	5.9	7.3	8.9	10.5
3	3.2	4.1	4.5	5.9	7.3	7.6	9.4	11.8	13.7
3½	3.4	4.5	4.9	6.5	8.0	8.5	10.6	13.0	15.4
4	3.7	5.0	5.4	7.2	8.9	9.5	11.7	14.4	17.2
4½	4.0	5.3	6.0	7.9	9.8	10.3	12.9	16.0	19.0
5	4.4	5.8	6.5	8.6	10.7	11.3	14.1	17.5	21.0
	2-in. Separation of Conduit								
2	2.7	3.5	3.9	5.2	6.4	6.8	8.5	10.5	12.5
3	3.3	4.4	4.9	6.5	8.1	8.7	10.8	13.5	16.2
3½	3.5	4.8	5.4	7.2	9.0	9.6	12.0	15.1	18.1
4	3.8	5.2	5.9	7.9	9.9	10.6	13.3	16.7	20.1
4½	4.2	5.6	6.4	8.7	10.9	12.6	14.6	18.3	22.0
5	4.5	6.1	7.0	9.4	11.8	12.7	16.0	20.1	24.2
	3-in. Separation of Conduit								
2	2.9	4.4	4.6	6.4	8.1	8.9	11.1	14.1	17.2
3	3.5	4.9	5.7	7.8	10.0	10.9	13.9	17.8	21.6
3½	3.8	5.3	6.2	8.6	11.1	12.0	15.3	19.6	24.0
4	4.2	5.8	6.8	9.5	12.1	13.1	16.8	21.6	26.3
4½	4.5	6.2	7.4	10.3	13.2	14.2	18.3	23.5	28.7
5	4.8	6.7	7.9	11.1	14.2	15.5	19.9	25.5	32.5

Cross-section (sq. in.) × 0.0257 = cu. yd. per 100 ft.

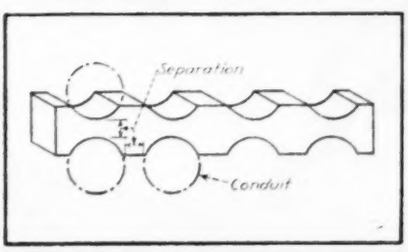


FIG. 1—Outline of grooved separator

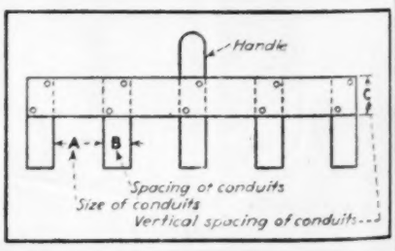


FIG. 2—Outline of comb-type separator

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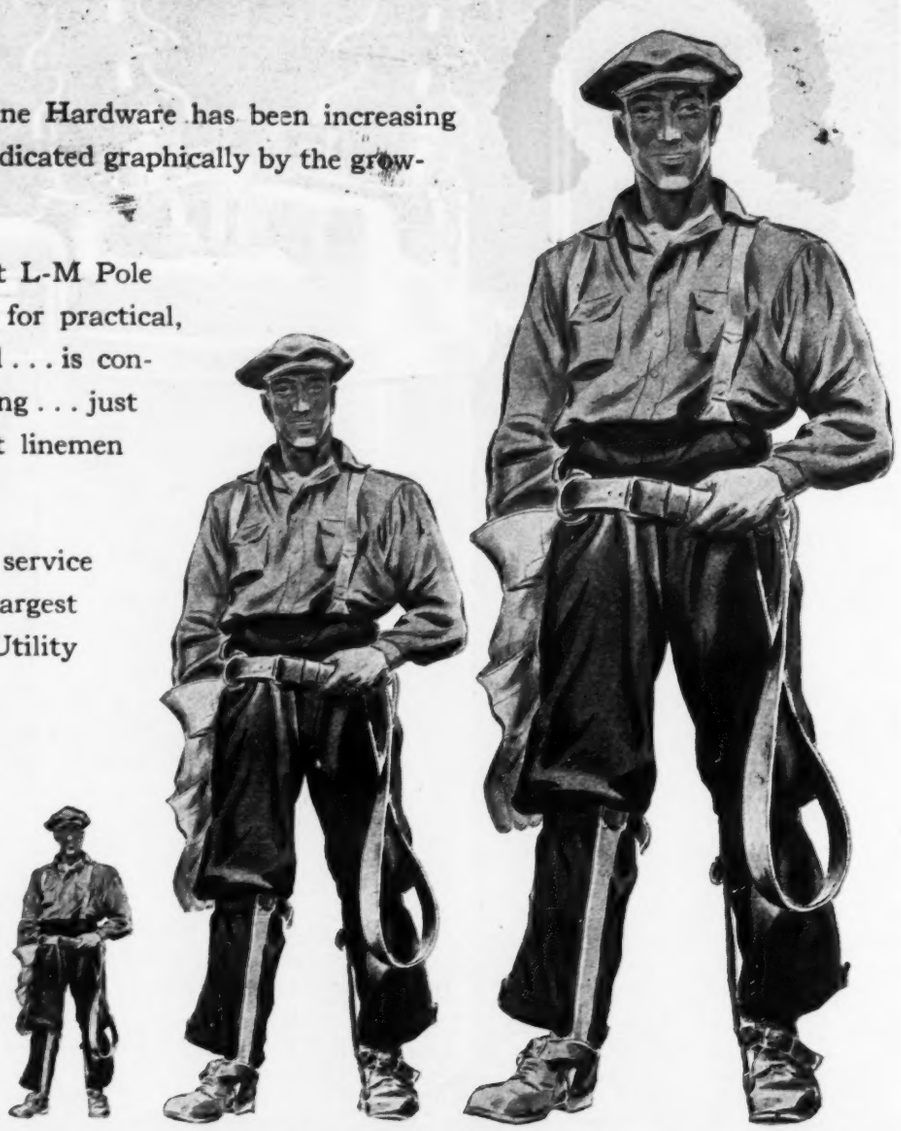

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TWO TIME DELAY OPENINGS to isolate branch lines . . . keep main lines open

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Permanent Faults are isolated by the time delay operations of the Recloser.

Coordination With Sectionalizing Fuses is possible on the time delay operations of the Recloser. Faults can be isolated before the Recloser locks open by blowing the sectionalizing fuse while service is continued on the remainder of the system protected by the Recloser.

Coordination Between Two Or More Reclosers in series is possible when installed on long rural lines. In addition, sectionalizing fuses beyond any of these Reclosers permit the isolation of any branch line upon which a permanent fault exists.

Ask your Line Material Representative for full information on the New Type "H" Kyle Automatic Oil Circuit Recloser. Let him show you how its use will save you revenue, time and manpower . . . will keep the main lines in operation.

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Lightning Protection Obtained for System

By LLOYD M. REBSAMEN*
Jonesboro, Ark.

Deep grounding, lightning arresters and a common neutral network has resulted in Jonesboro in a distribution system that rides through electrical storms with few outages. Results have been so satisfactory that during an intense storm the ringing

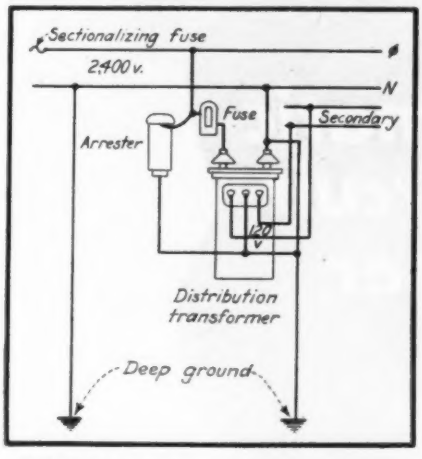


DIAGRAM of the transformer connections and grounding method to obtain lightning protection

of the telephone is more likely to be the line crew foreman calling the service department to check on his telephone rather than the service department calling the line crew foreman to repair line damage.

During the placing of the deep grounds (ELECTRICAL WORLD September 5, 1942, page 58) several severe electrical storms were experienced. It was noticed that all troubles from these storms were beyond the areas having the low ohmic-resistance deep grounds (ELECTRICAL WORLD November 25, 1944, page 96). Indications were that the planting of the deep grounds was one of the solutions to the lightning problem since as their area was extended the amount of trouble consistently reduced.

These troubles were further reduced by cutting over from independent primary and secondary neutrals to a common primary-secondary neutral. In many places a secondary neutral had been run a partial distance from one street to another. Therefore, a neutral grid could easily be obtained by tying the two neutrals together by a very short extension.

Lightning arresters protect all transformer installations and they are also placed at the more vulnerable points on the lines. Their tail leads are tied into the neutral network and thus to the many grounds. The low grid-resistance of these grounds results in dividing and subdividing the surge currents and clearing them from the line with short travel.

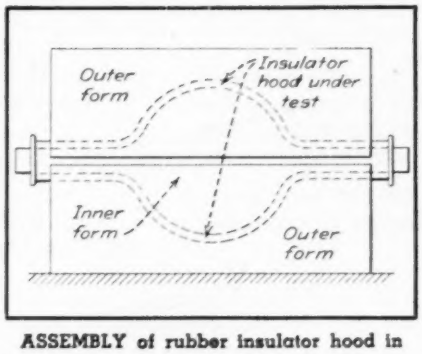
As an added protection to the generating station, the neutral of each circuit leaving the switchboard is grounded at each pole for a distance of approximately one-half mile from the plant. Lightning arresters were originally placed at a distance of 1,500-ft. from the plant on each circuit. Additional arresters have been placed at 1,000 and 500-ft. and surges have thereby been reduced to the extent that they do not register on the switchboard instruments.

•

Concrete Test Forms for Rubber Goods

High-voltage testing of rubber safety goods requires that contact be made over the whole surface of the piece, inside and out. For closed pieces, like gloves, the problem is easy; the glove is filled with water and hung in a water bath. But an open piece that won't hold water, an insulator hood, for example, is something else again.

Usually wooden forms, shaped to the particular piece and with contact



ASSEMBLY of rubber insulator hood in concrete testing forms

areas covered with thin copper sheet, are used. But these are difficult to make and unless finished with great care assurance of complete area contact is lacking.

An improvement on these is in use in the TVA testing laboratory in Chattanooga, Tenn. The forms are made of concrete cast directly in and on the shape to be tested in them. Each piece of concrete is reinforced, so to speak, with continuously bonded metal from which a connection terminal is brought out to the surface.

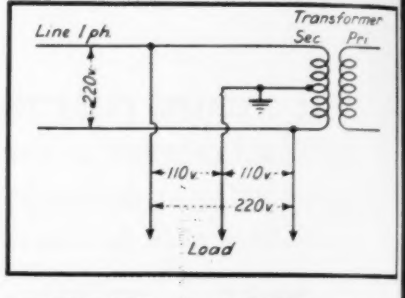
When not in use the concrete pieces are kept in a tub of water, thus assuring maximum conductivity. The weight of the pieces, assembled with the rubber item to be tested, helps to make effective contact with the rubber surfaces.

•

Distribution Transformer as an Autotransformer

By M. L. MONSON
Superintendent Fosston Municipal Light & Power, Fosston, Minn.

Lack of material for a temporary line prompted the use of a distribution transformer secondary winding as an autotransformer. Service was required for light and power to operate small saw motors. Some of the motors were designed for 110-volt operation and others could be connected for either 220 or 110 volts.



SECONDARY of distribution transformer serves as autotransformer

Since the secondary lines terminated about 800 ft. from the load location, the voltage drop on a 110-volt circuit would be so great that the motors could not operate when the load was applied. In order to overcome the excessive voltage drop and the stringing of another wire an autotransformer located near the load was considered the solution. The 110-volt load was balanced. But since the line was to be only for temporary use and, at the time, it would be impossible to obtain the delivery of an autotransformer, a decision was made to use a small distribution transformer in stock.

Connections of the single-phase secondary lines, transformer and service drop are shown in an accompanying diagram. Primary leads of the distribution transformer were

* Formerly Manager & Engineer, City Water & Light Plant, now Secretary Treasurer Barton-Mansfield Co.

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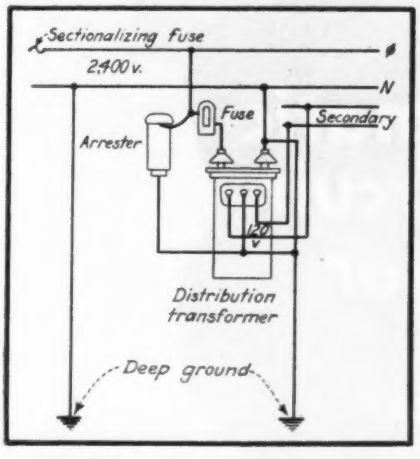

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These troubles were further reduced by cutting over from independent primary and secondary neutrals to a common primary-secondary neutral. In many places a secondary neutral had been run a partial distance from one street to another. Therefore, a neutral grid could easily be obtained by tying the two neutrals together by a very short extension.

Lightning arresters protect all transformer installations and they are also placed at the more vulnerable points on the lines. Their tail leads are tied into the neutral network and thus to the many grounds. The low grid-resistance of these grounds results in dividing and subdividing the surge currents and clearing them from the line with short travel.

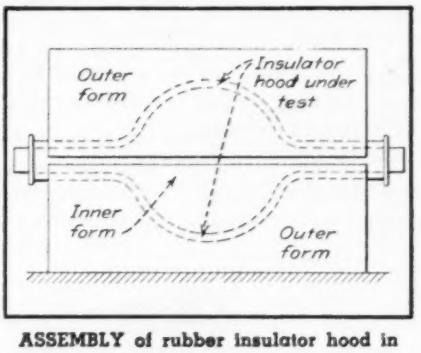
As an added protection to the generating station, the neutral of each circuit leaving the switchboard is grounded at each pole for a distance of approximately one-half mile from the plant. Lightning arresters were originally placed at a distance of 1,500-ft. from the plant on each circuit. Additional arresters have been placed at 1,000 and 500-ft. and surges have thereby been reduced to the extent that they do not register on the switchboard instruments.

•

Concrete Test Forms for Rubber Goods

High-voltage testing of rubber safety goods requires that contact be made over the whole surface of the piece, inside and out. For closed pieces, like gloves, the problem is easy; the glove is filled with water and hung in a water bath. But an open piece that won't hold water, an insulator hood, for example, is something else again.

Usually wooden forms, shaped to the particular piece and with contact



ASSEMBLY of rubber insulator hood in concrete testing forms

areas covered with thin copper sheet, are used. But these are difficult to make and unless finished with great care assurance of complete area contact is lacking.

An improvement on these is in use in the TVA testing laboratory in Chattanooga, Tenn. The forms are made of concrete cast directly in and on the shape to be tested in them. Each piece of concrete is reinforced, so to speak, with continuously bonded metal from which a connection terminal is brought out to the surface.

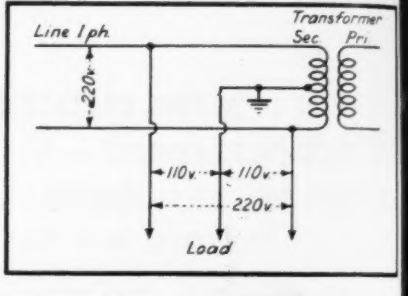
When not in use the concrete pieces are kept in a tub of water, thus assuring maximum conductivity. The weight of the pieces, assembled with the rubber item to be tested, helps to make effective contact with the rubber surfaces.

•

Distribution Transformer as an Autotransformer

By M. L. MONSON
Superintendent Fosston Municipal Light & Power, Fosston, Minn.

Lack of material for a temporary line prompted the use of a distribution transformer secondary winding as an autotransformer. Service was required for light and power to operate small saw motors. Some of the motors were designed for 110-volt operation and others could be connected for either 220 or 110 volts.



SECONDARY of distribution transformer serves as autotransformer

Since the secondary lines terminated about 800 ft. from the load location, the voltage drop on a 110-volt circuit would be so great that the motors could not operate when the load was applied. In order to overcome the excessive voltage drop and the stringing of another wire an autotransformer located near the load was considered the solution. The 110-volt load was balanced. But since the line was to be only for temporary use and, at the time, it would be impossible to obtain the delivery of an autotransformer, a decision was made to use a small distribution transformer in stock.

Connections of the single-phase secondary lines, transformer and service drop are shown in an accompanying diagram. Primary leads of the distribution transformer were

* Formerly Manager & Engineer, City Water & Light Plant, now Secretary-Treasurer Barton-Mansfield Co.

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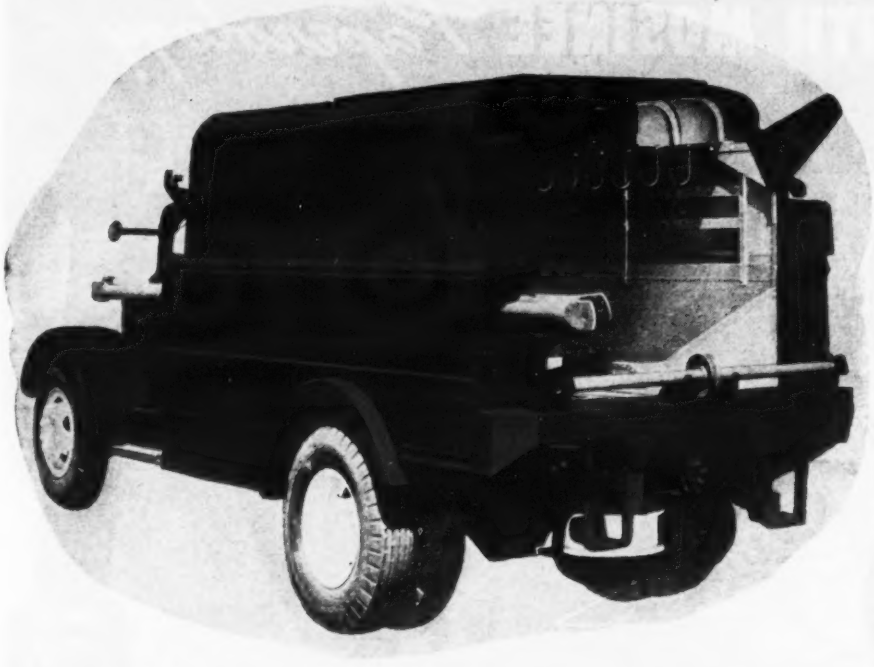

The "AMERICAN" Replacement Plan Assures Your Getting Just Exactly That.—

. . . Writes the Supt. of Transportation of A Progressive Western Power Company: - - -

.."We have 7 American Coach bodies on our system now. "One of my recommendations for post-war planning will be that we standardize on American Coach bodies. The first ones we bought in 1934 are still in service and in good condition, so we know they are good."

After the war is over transmission and distribution lines are going to need a lot of replacement and in order to do these jobs efficiently and speedily, and meet the pressing demand Utilities are going to need much new equipment to replace and augment their present over worked war-weary equipment — *And these Utility bodies and equipment will be wanted RUSH.*

• Appreciating this many companies are taking advantage of the AMERICAN COACH REPLACEMENT PLAN and getting set for early deliveries quickly after chassis are released by the government.

• It will pay you to get the full information about this plan — Write today — There's no obligation —

Some Reasons Why "Americans" Are TOPS:—

Correct Design • Superior Quality Construction • Comfort • Convenience • Safety • Endurance • Low Operating Cost • Fine Appearance

BUY MORE WAR BONDS

THE American COACH & BODY CO.

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PUBLIC UTILITIES EQUIPMENT FOR MOTOR VEHICLES

disconnected from the winding. The 220-volt line leads were connected to the secondary winding and the center tap was used for the neutral.

The arrangement was satisfactory and saved considerable expense and annoyance when materials were difficult to obtain.

•

Oils and Lubrication of Steam Turbines—VI

J. A. TRISKA*

Technical and Research Division
The Texas Co., New York City

Procedure of Reconditioning—Settling

To keep a turbine oil in service, products of oxidation, polymerization and contamination must be removed continually. There are a variety of ways for removing such oil deterioration products; all are contingent upon two basic types of equipment:

1. Reconditioning by methods which can only remove insoluble materials.

2. Reconditioning by methods which not only remove insoluble sludges, but also the soluble products.

The first and simplest and most readily accomplished means of effecting at least partial clarification of a used turbine oil is to allow it to stand quietly in some form of settling tank for a period of several days or even weeks. During this time, and depending on the efficiency of the settling and any decanting facilities, it is generally possible to remove suspended insoluble oxidized material, foreign particles, dirt and water. Separation of such oil contaminants is accomplished by gravity alone.

Equipment Controlling Factor

The equipment available for settling will control the effectiveness of the procedure. Good practice in turbine design is to provide rest tanks, so arranged that two batches of oil are available which can be alternated in use. By means of bottom drawoffs, adjustable pump-out lines or manual decanting of the clear oil (in smaller units), the clarified oil is separated from the settled materials. Settling is most effective in flat or horizontal tanks of minimum depth.

Settling may be accomplished at any temperature. Some authorities believe that, where time will permit, thorough clarification is gained without heating coils; probably the best

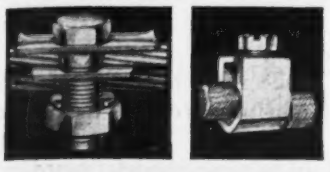
* This series began September 30, page 93 in the ELECTRICAL WORLD.

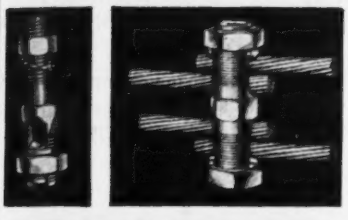
"All SIZES of SERVICE CONNECTORS—

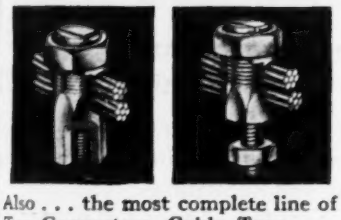
from No. 10 to 1,000,000

and All TYPES"

You can find exactly the service connector you need, in the Penn-Union Catalog: Yoke-and-Nut type, in a complete range of sizes . . . Service Entrance connectors . . . Service Post and Special connectors in wide variety.







Also . . . the most complete line of Tee Connectors, Cable Taps . . . Straight, Parallel, Elbow and Cross Connectors . . . Bus Supports, Clamps, Spacers . . . Grounding Clamps, Terminal Lugs . . . practically every good type.

Leading utilities, industrials, electrical manufacturers and contractors have found that "*Penn-Union*" *on a fitting is their best guarantee of Dependability.* Write for the Penn-Union Catalog.

PENN-UNION ELECTRIC CORPORATION
ERIE, PA. *Sold by Leading Jobbers*

PENN-UNION
Conductor Fittings

"Automatic"
FIRE-FOG
★ IT BLANKETS ★ IT ISOLATES ★ IT QUENCHES

H_2O - plus "Automatic"
STOPS TRANSFORMER FIRES ALMOST BEFORE THEY START

● Yes—plain water—in FIRE-FOG form now safely puts out a transformer fire moments after it starts—isolates the burning unit, guards the others from damage.

Let's assume that you've installed an "Automatic" FIRE-FOG System as protection against transformer fire hazards. What will happen if fire breaks out?

Instantly, automatically, FIRE-FOG nozzles "shoot" a mist-like spray at the fire, blanket the blaze completely—millions of water droplets hammer down the flames—cool the fire area. In an incredibly short time the fire is quenched

. . . and a costly conflagration—plant shut-down—production loss, are all avoided thanks to plain, ordinary water transformed into a potent all-around fire fighter by "Automatic."

★ YOUR FIRE HAZARD? You need a FIRE-FOG installation for protection from such fire hazards as electric transformers, oil switches and circuit breakers. Write for detailed information—there's no obligation.

"AUTOMATIC" manufactures and installs a complete line of fire protection devices and systems for all types of fire hazards.

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YOUNGSTOWN, OHIO . . . OFFICES IN 31 CITIES

• RUBBER POWER CABLES • VARNISHED CAMBRIC CABLES •

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IMPERIAL NEOPRENE

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For Heavy Duty Industrial Use

The tough NEOPRENE Jacket gives this cable maximum life under the most severe operating conditions. Among its advantages, it is

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Furnished in all sizes from 18-Two Conductor to 500,000 Three Conductor.

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TRENTON, N. J.

• IMPERIAL NEOPRENE JACKETED PORTABLE CABLES •

results are obtained at temperatures of around 120–140 deg. F., depending upon the time available for settling. Excessively high temperatures should be avoided to prevent the possibility of accelerating oxidation. Practically no settling will occur while the oil is being heated because of the convection currents created. Conversely, settling at low temperatures should be avoided because the rate of separation is retarded in a cold-thickened oil.

There are disadvantages to reconditioning oil by settling and decantation just as there are advantages. The disadvantages include:

1. The necessity for having two complete batches of oil.
2. The turbine must generally be shut down for change-over.
3. Considerable space is required for settling tanks.
4. While a batch of oil is in service, impurities are not removed as they collect, but are permitted to build up to some predetermined concentration, at which time the batch is withdrawn and purified.
5. Only insoluble contaminants are removed. The oil may still contain soluble oxidation and polymerization products.

•

Fire Hazards and Their Elimination*—VI

An outline is presented for safeguards against oil fires in generating plants and substations.

A. Fuel Oil—Tanks for storage of fuel oil should be guarded against sparks and flame, which may result from electric lights, workmen's tools, nearby fire and smoking. Such hazards are greater with tanks nearly empty than when tanks are full. No repairs should be undertaken on or around oil tanks, except by workmen specially instructed in necessary safety precautions.

Grass and weeds should be kept cut inside the dykes of fuel oil tanks. For tanks without dykes, ground area 10 ft. from foundations or tanks should be kept free from any kind of vegetation or combustible material.

Fuel oil should not be kept in open containers within buildings or structures. For storage of torches used in

* Concluding a series of articles which began in ELECTRICAL WORLD, September 2, 1944, page 100; adapted from "Handbook of Fire-Safety Practices for Public Utility Property," Edison Services Incorporated, New York, N. Y.

lighting boiler furnaces, covered metal boxes should be provided.

Where daily fuel oil samples are taken and accumulated over an extended period in order to obtain a composite sample, the daily samples should be kept in metal containers equipped with close-fitting covers. No oil should be allowed to collect on or around the containers.

B. Electrical Insulating Oil—Same as for fuel oil.

C. Lubricating Oil—Where suitable arrangements can be made, lubricating oil reserve stock should be stored outside the plant building. This storage should be in sealed metal drums or in approved tanks equipped with pumps. All fires and open lights should be kept at a safe distance from the storage.

Lubricating oil systems in generating plants and substations, which may involve storage tanks, coolers, purifiers, pumps and piping, as well as hydraulic governors for turbines, require special precautions in operation and maintenance to assure safety. The greatest danger arises from accidental leaks which may permit oil to come into contact with nearby high-temperature steam pipes or turbine parts, thus igniting oil. Employees whose duties include work on lubricating oil equipment should be thoroughly familiar with special operating and safety rules in force.

D. Oil Leakage and Drippings—Particular care should be taken to keep premises near oil storage free from oil drippings. Any spillage should immediately be gathered into containers or absorbed with sand blanket. In case leaks or overflow cannot be stopped promptly, warning signs should be posted and fire extinguishers or water hose lines with spray-type nozzles should be obtained and placed conveniently.

•

Correction

An error occurs in labelling one of the temperature charts in the article "Ground Temperature for Cable Loading," which appeared in the ELECTRICAL WORLD November 25, page 93.

As the charts appeared both are for the same period, 1943 and January of 1944; actually the lower should be for the year 1942 and January of 1943. The top chart is correct as printed.

REACHING FIRE FIRST

Randolph "4" Carbon Dioxide Fire Extinguisher

OUT OF THE BRACKET, INTO THE FLAMES . . . ALL WITH JUST ONE HAND. HERE'S SPLIT-SECOND FIRE FIGHTING—THE EASY WAY!

Few people think about fighting fire until they actually face the flames. That's why it's so important that every fire extinguisher on your property operates *easily—quickly—thoroughly.*

Randolph "4" speeds your fire defense. Chokes off gasoline, oil, paint, machine, electric fires—instantly. Hits the blaze before damage is done!

Approved by Underwriters' Laboratories, Inc.

Mobilize against fire with Randolph carbon dioxide. For complete details and prompt service, call your supply house or write us—today.

JUST A TOUCH OF THE THUMB...

sends powerful carbon dioxide into the blaze . . . snuffs out generator, switch, motor, dynamo fires in split-seconds. Has no valves or nozzles to adjust.

Randolph "4" does not damage equipment or conduct electricity. A safe, dry gas, it leaves no trace, stain or mess. Will not deteriorate or freeze in extreme temperatures—eliminates annual recharging.

Randolph Laboratories, INC.

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Send for **FREE** booklet "Sharpshooting at Flames." Illustrates CO_2 fire-fighting.

NAME_____

ADDRESS_____

THE RECORD IS
KELVINATOR POLARSPHERE

TROUBLE-FREE!

Three years of war have shown what a priceless asset Kelvinator's record of trouble-free performance has been.

When freedom from trouble and service was needed most by service organizations beset with manpower and material shortages, Kelvinator set a record that has been the envy of the industry.

The reason for this great record is the Polarsphere—Kelvinator's famous cold-making mechanism that is sealed in steel and permanently oiled for years of dependable, trouble-free operation without any attention whatever.

With this great performance record behind it, Kelvinator is looking ahead with the greatest of confidence to the postwar years—a period when dependability of operation will undoubtedly be a most important sales feature in home refrigeration products.

The Kelvinator Polarsphere will be one of Kelvinator's most important assets in its plans for getting its tremendous postwar volume of Refrigerators and Home Freezers into homes where they will help build the greatest domestic load in utility history.

LOOK AHEAD WITH KELVINATOR

DIVISION OF NASH-KELVINATOR CORPORATION

Kenosha • Milwaukee • DETROIT • Grand Rapids • Lansing

LOAD SERVICING

Commercial
Industrial

Residential
Rural

Utility Helps Make G. I. Christmas

Through the enterprise of the Tampa Electric Co., Hillsborough County, Fla., shipped out some 20,000 cans of homemade food, mostly fried chicken, in the overseas Christmas mailing period, September 15 to October 15. Most of the women who sent gifts of canned food to about 4,000 boys serving all over the globe didn't realize they could mail them that "taste of home" until the utility promoted the idea and made canning equipment available.

Last May, Leisure House, as the company's model kitchen is called, embarked on an overseas canning project. Several hundred servicemen's mothers, wives and friends availed themselves of the service. Mrs. Alleene Epps King, director; Mrs. Trixie Moore Martin, canning supervisor, and their assistants thought they were busy until The Tampa Tribune carried a Sunday feature story entitled, "How Tampa GI's Overseas Get Fried Chicken From Home."

The idea captured public imagination and Leisure House was swamped. Calls for information and appointments to can foods requiring processing tied up ten telephone lines. Women waited in line for hours to can cake, cookies, bread, nuts and candy, which need only be sealed properly in cans. Within a few days Leisure House was booked up almost two months in advance and was forced to turn away hundreds of women.

The Christmas mailing period was to begin in two weeks, so company officials rushed plans to open temporary centers throughout the country. With the cooperation of the county home demonstration agent, a dozen centers began operating September 15. Seven more opened in the following week. The centers were staffed by competent volunteers, most of them Red Cross nutrition aides. Several centers were the kitchens of private homes. Cans by the hundreds were delivered to the 17 centers each day by the Red Cross motor corps.

The Tampa Electric Co. ran ads about the free service (cans were sold at cost) and furnished equipment and directed activities at most of the centers. The company even wired the downtown centers at the county home demonstration office so it could operate at night. A few centers were not equipped with electric ranges, so the women cooked with gas, paid for by the electric company.

Fried chicken topped the list of foods canned, but there was everything from porterhouse steaks to pecans, not to mention wild turtle, shrimp and rice and Cuban coffee. Some even went so far as to can sweaters, wrist watches, wedding rings, hair oil and a radio condensor. One woman wrapped waxed paper around a bottle of aspirin and a bottle of liver pills, sprinkled peanuts around them in a can, sealed it and sent it to her son, who had written complaining of headaches.

A bomber pilot in England wrote his mother, "I shared my fried chicken with the crew. It was as fresh as if it had just come off your kitchen stove. This is a wonderful service good old Tampa Electric is doing."

CANNING FOOD FROM HOME for soldiers' Christmas brings G. I.'s praises

•

Management's Desires in Store Lighting

There are half a dozen or more major requirements in lighting that store owners and management want after the war. These desiderata are not for the "big store" alone but are practical regardless of the size of the retail outlet.

Those items which management and store owners want in their postwar lighting improvements are:

1. Full-spectrum lighting, to eliminate counteracting lighting and thereby reduce heat, numbers and sizes of fixtures and operating cost.

2. Cooler lighting which does not cause fading of merchandise, markdowns, exchanges and returns.

3. Lower unit cost per bulb or tube, for ease of replacement and maintenance will be big factors in choosing the lighting system.

4. Metered control of bulb efficiency.

5. Flexibility in lighting, with fingertip controls that produce variable intensities under which merchandise is shown.

6. Germicidal lighting to use in nurseries, rest areas, children's rooms, etc. as a disease combatant.

7. And above all, management wants to reduce its present lighting costs. It wants higher efficiency of

HEADQUARTERS for WIRE and CABLE

*Copr. 1944 RCC

As copper is released for civilian use, many wiring projects will go forward.

So it seems to be a good time to point out again that Rome Cable is a splendid source of supply for:

Bare and Tinned Copper Wire
(in rounds, flats and squares)

Bare and Tinned Strand Weatherproof Wire and Cable
U.R.C., Slowburning

Magnet Wire
Cotton, Asbestos, Paper, Glass

Rubber Covered Wires and Cables
Building Wire—Braided and Lead Covered
Power Cables—Single and Multiple Conductor
Control Cables
Service Entrance Cable
Service Drop Cable
Signal Wire—Single and Multiple Conductor

Rubber Jacketed Cords and Cables
Flexible Cords, Type S, SJ and SV and POSJ
Portable Power Cable—Types W and G
Mining Machine Cables
Arc Welding Cable
Motor Lead Cable

Synthetic Insulated Wires and Cables—(Thermo Plastic)
Rome Synthinol Type SN
Rome Synthinol—Machine Tool and Control Wire
Radio Wires—Cotton and Glass Braided
Control Cables

Miscellaneous
Aircraft Wire
Fixture Wire
Motor Lead Wires—Flexible and Extra Flexible

Inquiries by mail, phone or wire will have immediate attention.

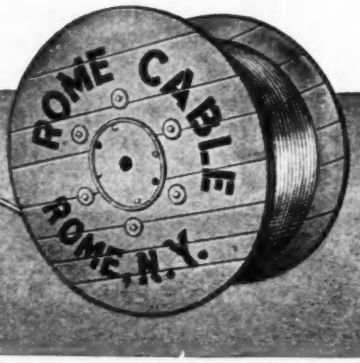
"HERE'S A GOOD SOURCE OF SUPPLY," says *ROMEY

"All the materials that go into Rome cable products have to be good," says Romey. "We have a heritage to protect . . . a long-recognized quality to maintain. We roll our own copper rods . . . draw our own copper wire . . . do our own stranding and insulating."

FROM BAR TO FINISHED WIRE

ROME CABLE CORPORATION

ROME • NEW YORK



Protect Busy Motors with Deltabeston Magnet Wires

You can stop frequent failures by protecting busy motors with Deltabeston Magnet Wires. The next time your motor is sent to the repair shop for rewiring, install Deltabeston Asbestos-insulated Wires and Cables. Motors wired with Deltabeston stay on the job longer and perform with the utmost dependability even in severe operating conditions. If you use ready-made coils with class B insulation, specify Deltabeston-wound coils.

Deltabeston Magnet Wires are designed for winding motors, lifting magnets, brake coils, generators, starters and other electrical equipment. Deltabeston is insulated with asbestos purified by an exclusive process. The felted asbestos is impregnated with a resin compound to make it highly resistant to heat, moisture and most corrosive vapors. Deltabeston's soft copper conductors can be formed into the most intricate coil without rupturing the insulation. It's available in round, square and rectangular shapes.

For additional information write for our new Deltabeston Wire and Cable Catalog. It's free. Send your request to Section Y-1242-9, Appliance and Merchandise Dept., General Electric Co., Bridgeport, Conn. Deltabeston Wires and Cables are distributed nationally by Graybar Electric Co., General Electric Supply Corp., and other G-E Merchandise Distributors.

BUY WAR BONDS AND KEEP THEM

Hear the General Electric radio programs; "The G-E All Girl Orchestra" Sunday 10 P.M. EWT, NBC. "The World Today" news every weekday 6:45 P.M. EWT, CBS.

GENERAL ELECTRIC

lamp and equipment, more f
candles for fewer dollars.

These points were brought out
R. J. Chapin, superintendent, c
struction and maintenance divisi
Marshall Field & Co., in a paper
cently presented before the Illumin
ing Engineering Society.

•

Which Appliances Will Farmers Buy

Waterheaters, automatic water s
tems, deep-freeze refrigerators a
farm workshop equipment are t
four items of electrical equipment th
rural customers of the Nebras
Power Co. say they want to buy fi
after the war. This fact was esta
lished when the Omaha company su
veyed a representative group of
farm customers recently asking the
to identify from a prepared list
25 items, the ones they intended
buy and in what order.

The survey questionnaire, in t
form of a business reply card, w
sent to some 200 farm customers s
tered uniformly over the compa
service area without regard to t
type of farm or its size. Of 200 car
sent out, 104 were returned.
these, 96 percent were signed by th
customer.

Buying Preferences of Nebrask Farmers

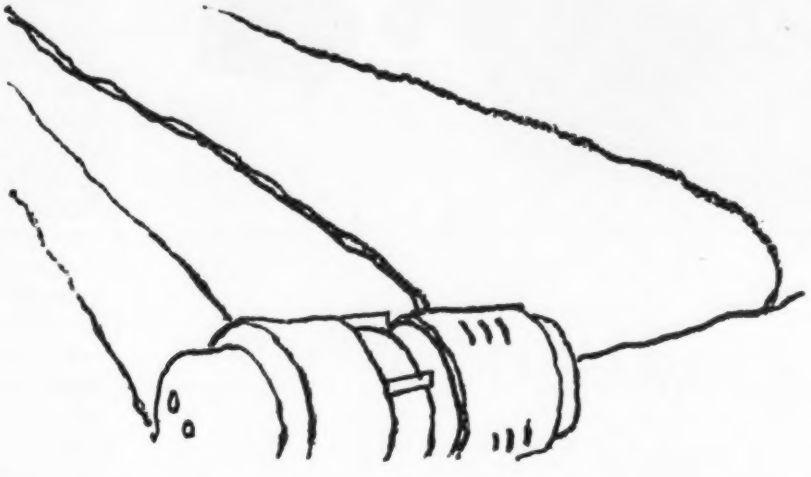
Intend To Buy %	Appliance	Sales to 4,000 Farms	Preferenc for Firs Purchase
14.3	Range	572	
17.2	Refrigerator	688	
31.0	Waterheater	1240	Firs
12.0	Radio	480	
23.0	Deep-Freeze Refrigerator	920	Thir
00.4	Ironer	16	
00.4	Washer	16	
00.1	Dehydrator	4	
17.2	Roaster	688	
00.4	Heating System	16	
18.6	Fans	744	
12.0	I.E.S. Lamp	480	
26.3	Workshop Equipment	1052	Fourt
21.9	Pump Jack	876	
28.5	Automatic Water System	1140	Second
28.5	Brooder-Chicken	1140	
00.2	Brooder-Pig	8	
13.0	Milking Machine	520	
00.3	Milk Cooler	12	
10.1	Cream Separator	404	
16.4	Feed Grinder	656	
16.4	Chicken House Lighing	656	
12.0	Electric Fence	480	
24.1	Grain Elevator	964	
28.5	Additional Motors	1140	

To interpret the replies in terms o
the prospective market for domest
and farm appliances in the area, com
pany analysts applied the percentag
of replies that indicated intention t
buy a specific appliance to the 4,00
farm customers served by the com

A FIBERGLAS* CASE HISTORY

REWIND REQUIREMENTS REDUCED 75%

. . for motors operating 168 hrs. per week



FIBERGLAS INSULATION extended period between rewinds from 90 days to over a year

Continuous service for over a year and still going strong instead of rewinding every 60 to 90 days—that is one of the advantages gained by a major steel company (name on request) when the specifications were changed to Fiberglas insulation.

Four 440 hp motors drawing 18,000 amps from a 220-volt output are used by this company for barge loading. They operate outside, 24 hours per day, 7 days a week.

When impregnated Fiberglas was applied, it overcame the limitations of the organic insulating material with which the motors were previously wound. The frequent costly interruptions for rewinding have been stopped. And after more than a year of continuous operation there is no indication of insulation failure.

Fiberglas Insulation Advantages

Being inorganic, the glass fibers have low moisture absorption, and will not burn or rot. Fiberglas insulation materials have high tensile strength . . . will not shrink or stretch in the presence of heat or moisture . . . are resistant to high temperatures, acids, corrosive vapors. Impregnation of Fiberglas results in still further electrically and mechanically important advantages, such as high dielectric strength and insulation resistance. And in addition the use of the right impregnants correctly applied increases the effectiveness and efficiency of many of the inherent characteristics of Fiberglas.

Ask your motor manufacturer about Fiberglas-insulated motors. Or, if you are having motor failures, ask your repair shop to use Fiberglas on the next rewind job.

Fiberglas electrical insulation materials, plain or treated, are now available. For complete information call your distributor or write *Owens-Corning Fiberglas Corporation, 1858 Nicholas Building, Toledo 1, Ohio. In Canada, Fiberglas Canada Ltd., Oshawa, Ontario.*

FIBERGLAS *T. M. Reg. U. S. Pat. Off.* **ELECTRICAL INSULATIONS**

YARNS • TAPES • CORD • SLEEVING • CLOTH AND OTHER FORMS

The new U.S.-made "Megger" Insulation Tester in molded plastic case. Ask for Bulletin 1735-W.

THE "MEGGER" TESTER IS ALWAYS READY

When the need arises for emergency insulation testing of electrical equipment—it calls for immediate and positive action. "Megger" Insulation Testers are *always* ready for use, day or night, even in the most remote, isolated, inaccessible locations. The self-contained hand-cranked generator is a source of power that is reliable and wholly independent of any battery or other outside source. The "Megger" Tester is a complete unit in itself.

For occasional use, for periodic tests and for emergency tests, your "Megger" Tester is *always ready.* If you do not have full information on how to use and operate "Megger" instruments, write for a free copy of the Pocket Manual of "Megger" Practice, No. 1420-W.

JAMES G. BIDDLE CO.
1211-13 ARCH STREET • PHILADELPHIA 7, PA.

"MEGGER"
TRADE MARK REGISTERED U.S.PAT.OFF.
Insulation Testers, Ground Testers and Ohmmeters

pany to measure the total potential market volume for each appliance. This tabulation showed that 31 percent of the customers would buy a total of 1,240 waterheaters; 28.5 percent would buy 1,140 automatic water systems and 23 percent about 920 deep freeze refrigerators.

•

Flexibility an Asset in Street Lighting Contracts

In renewing a street lighting contract in an eastern city of about 50,000 population, the supplying utility and the municipal authorities executed an agreement in which present and future requirements were set forth comprehensively and succinctly in an endeavor to free this class of service from misunderstanding. It was desired to anticipate all likely contingencies without becoming swamped in a morass of detail which would be difficult to handle. The contract was drawn according to customary legal procedure, specifying duration, provision for extension or cancellation, continuing ownership and operation of its plant by the utility, method of billing, obligations as to service and lamp maintenance, adjustments for outages, and agreement to meet the changed conditions resulting from the installation of special equipment and service. Beyond these points, the contract embodied provisions to secure fair and flexible operation in the face of various contingencies outlined below, and the general structure of the agreement is as applicable to small rural communities (one having 39 street lights on a base annual price of $624) as to urban centers.

Ten Year Agreement

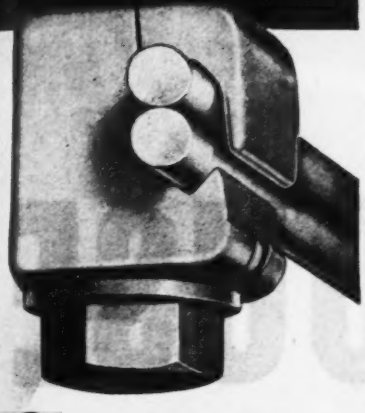
The city agreement was for 10 years, and the annual minimum payment for the initial installation of series incandescents totaled $61,576. The initial installation consisted of: 1,217 lamps of 600 lumen rating, 21 of 1,000, 45 of 2,500, 294 of 4,000, 95 of 6,000 and 128 of 10,000, plus four 250-watt (multiple) floodlights at a war memorial operated to 1 a.m. The basic burning schedule was 4,000 hr. per year on a basis of operating from 30 min. after sunset to 30 min. before sunrise, with an adjustment provision for extra hours' use.

The city agreed to continue units of

Rush job?

HERE'S HOW

FARGO CONNECTORS save time 4 Ways!



1 NO LOOSE PARTS to fall off. Fargo is the original one-piece connector.

2 ALWAYS THREADED, the Fargo Connector is always ready to tighten the tap. Saves time!

3 CAREFUL MACHINING makes Fargo threads easy turning, gives you permanent high pressure contacts at low wrench torque.

4 QUICK DELIVERY to your job site on any good priority assured by ample Fargo Connector stocks.

Made by **FARGO MFG. CO.**

Distributed by

LINE MATERIAL CO.

MILWAUKEE • WISCONSIN

You can build rural taps and branches with less material, less labor–and with consequent savings in overall costs–where *Crapo* Steel Conductors are employed. These economies will be important in the rural construction program just ahead.

Crapo Steel Conductors, because of their high tensile strength, make possible long spans with flat sags and greater ground clearance, reduce the number of pole structures required, save manhours. They provide more than ample conductivity for the average loads carried by typical rural taps and branches.

Write for Engineering Manual

• • •

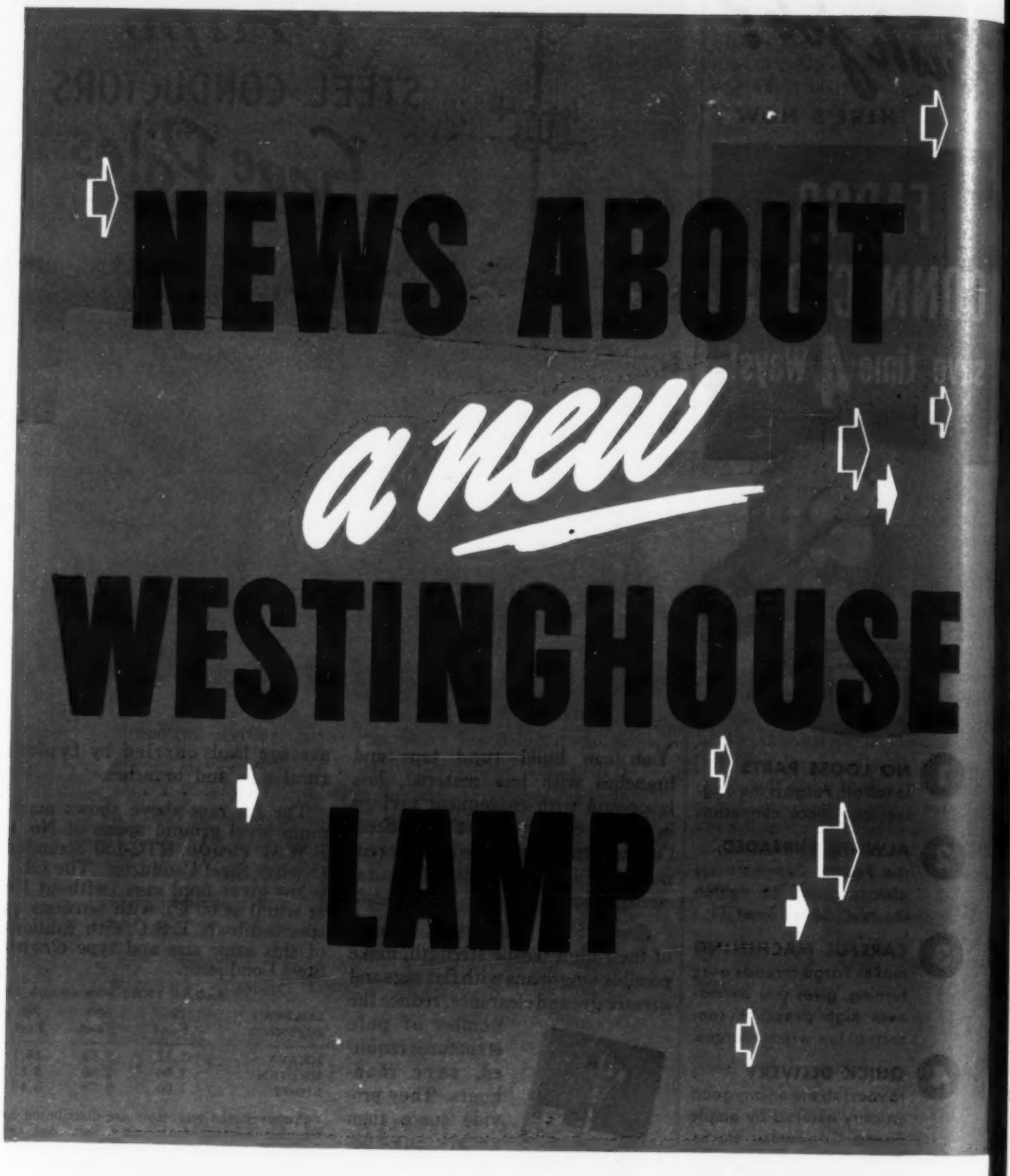
The diagram above shows maximum level ground spans of No. 6 B.W.G. *Crapo* HTC-130 Stranded (3-wire) Steel Conductor. The table below gives final sags (without ice or wind) at 60° F., with tensions as specified by N. E. S. C. (5th Edition) of this same size and type *Crapo* Steel Conductor.

LOADING DISTRICT	SAG IN FEET FOR SPANS OF 300 Feet	500 Feet	700 Feet
HEAVY	1.11	3.94	15.7
MEDIUM	1.00	2.89	6.17
LIGHT	1.00	2.78	5.40

Crapo Steel Conductors are distributed by Graybar Electric Company, Inc. Ask the Graybar representative or write direct for Engineering Manual giving complete data.

INDIANA STEEL & WIRE COMPANY
MUNCIE, INDIANA

Crapo HTC-130 STEEL CONDUCTORS



Westinghouse

PLANTS IN 25 CITIES OFFICES EVERYWHERE

...FOR STORES, SHOWCASES, ARCHITECTURAL AND DECORATIVE EFFECTS...

New "Slimline" lamps—long, slender and fluorescent—are being made by the Westinghouse Lamp Division. Samples will be available shortly to fixture designers and others interested in the development. These tubes will be 42 and 64 inches long respectively, and have a diameter of only ¾ of an inch. Later, when manufacturing conditions permit, samples of lamps measuring 72 and 96 inches long with a thickness of one inch will be available.

All these lamps will be hot cathode of the instant starting type which do not require starters. They may be operated singly or in multiple with a ballast, or on series circuits with a high voltage transformer. They will be available in the standard white color and will have a new type of single pin base. The life rating 200 milliampere operation will be of the same order as the standard 40 watt fluorescent lamps.

They will present long ribbons of soft, cool light which will be very effective in places where decorative yet highly efficient lighting is required, and where reflector space is limited.

Once again the pioneering spirit of Westinghouse shows the way to better See-Ability with better lamps. Westinghouse Electric & Manufacturing Co., Lamp Division, Bloomfield, N. J.

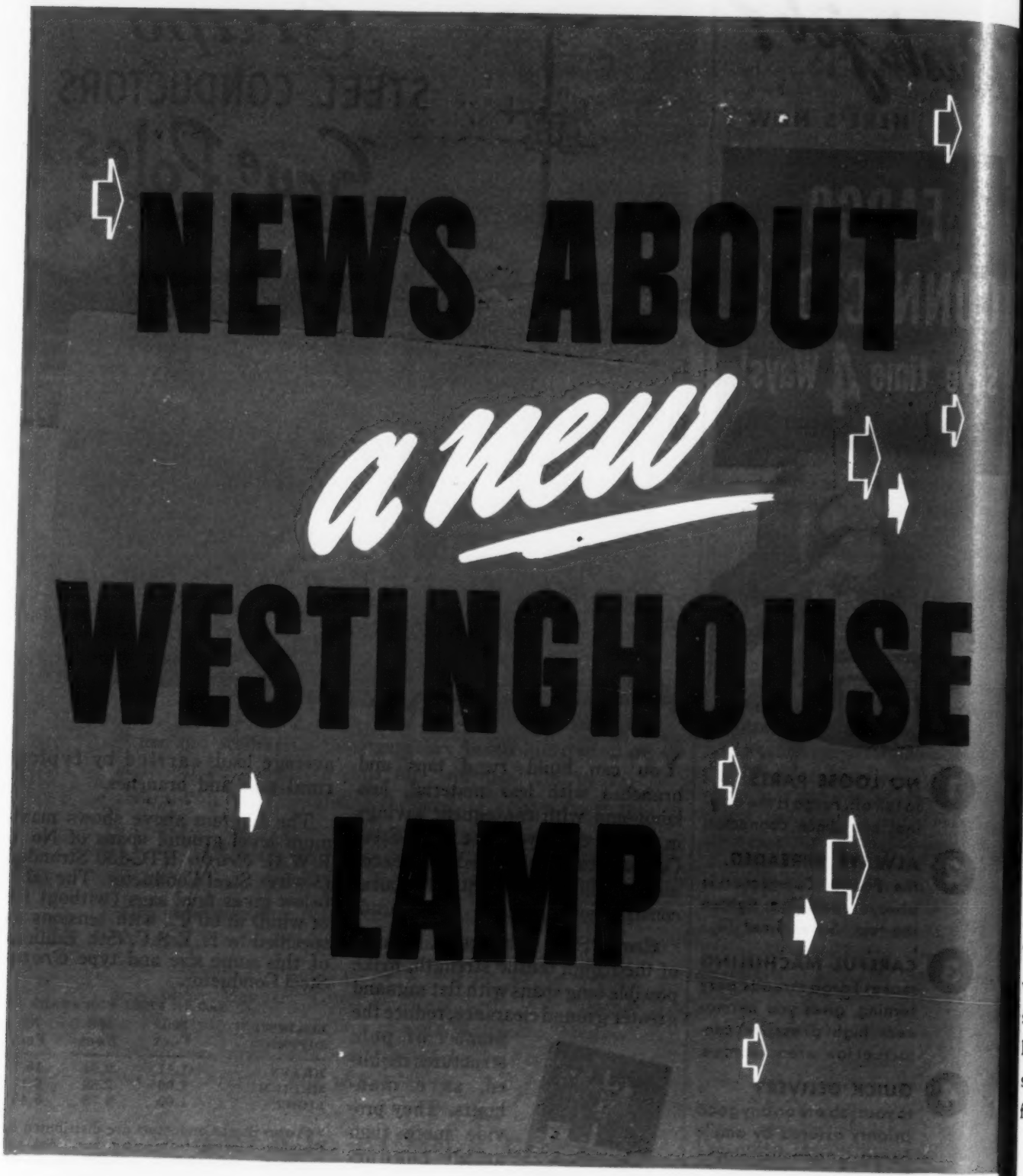
EFFECTIVE IMMEDIATELY, THE FOLLOWING LIFE RATINGS APPLY ON 40 AND 100 WATT WHITE AND DAYLIGHT WESTINGHOUSE FLUORESCENT LAMPS

Burning Hours per Start	Rated Average Life* (Hours)		% of Initial Lumens per Watt at 70% of Rated Life**	
	40 Watt	*100 Watt*	*40 Watt*	*100 Watt*
3	2500	3000	84	78
6	4000	4500	76	72
12	6000	6500	70	69

*Life under specified test conditions. This includes such factors as operation on AC circuits at rated voltage, the use of starters and ballasts or transformers of proper design.

**All fluorescent lamps depreciate in light output continuously thruout life. Ordinarily the use of fluorescent lamps beyond 6500 hours cannot be economically justified.

Mazda Lamps FOR SEE-ABILITY



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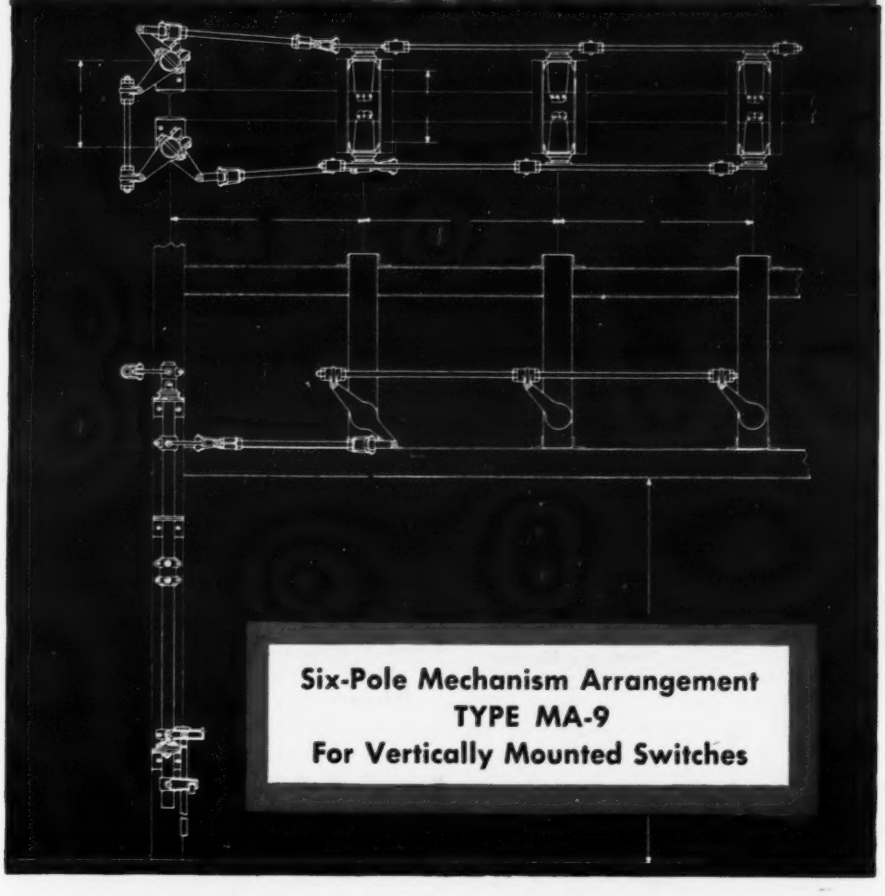
Mazda Lamps FOR SEE-ABILITY

Flexibility to meet specific station needs

HI-VOLTAGE GANG SWITCHES



Six-Pole Mechanism Arrangement
TYPE MA-9
For Vertically Mounted Switches

● One of the important features of Hi-Voltage Gang Switches is the wide range of structural designs to which these switches can be readily and economically adapted. Composed of a series of standard units — the switch can be designed and built up to meet your specific condition. No complicated adjustments of working parts is necessary. All major operating adjustments have been made at the factory. You merely install the switch as directed and make any minor adjustments that may be needed for installation. No holes to drill or parts to cut in the field. These are time saving features that lower your installation costs and actually make Hi-Voltage Switches more economical.

HI-VOLTAGE
EQUIPMENT COMPANY
2881 East 79th Street • Cleveland 4, Ohio

at least the size and number named in the initial installation schedule and to pay at least the annual minimum therefore without regard to the type and number of lamps actually in use.

In order to encourage the use of additional street lighting the contract provided base prices along promotional rate lines for additional service. Where no line wire extensions are required (additional lamps being added or inserted along existing lines) service is furnished at prices ranging from $16.68 per lamp-year for 600-lumen units to $96.72 for 10,000-lumen lamps and $124.80 for 15,000-lumen lamps.

Where additional lights require wire extensions on existing poles, then in addition to the above annual basic prices there is an added charge of 2.2 cents per year per line-ft. of extension taken as the center-to-center distance between poles.

Provision Made for Additions

Where additional lights require extensions beyond the existing poles of the company; i.e., new poles and wire, then the addition to the above annual basic prices is an annual charge of 4.5 cents per year per line-ft.

Should the company be required to serve lamps through additional underground connections, such service is furnished at the above annual basic prices plus 18 percent annually on the amount of the difference between (1) the company's total investment for facilities necessary to enable it to furnish and connect such lamps and supply service through underground connections, and (2) the company's cost for overhead fixtures which otherwise would have been provided had the company supplied an overhead connected service.

Existing lamps will be changed to larger units at the request of the city in accordance with the agreed upon prices for lamps for additional service where no extensions are called for.

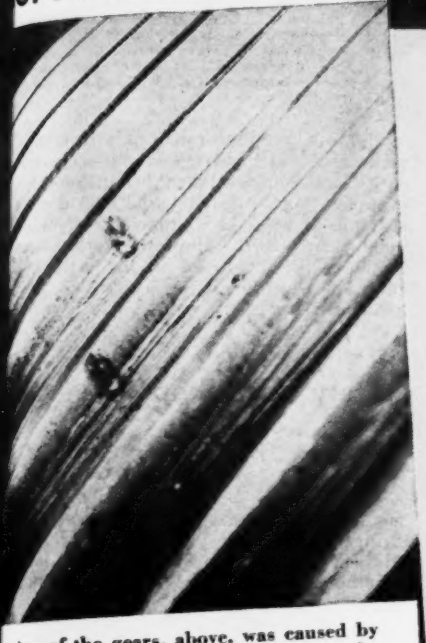
Outage credits per hour range from 1.5 mills for 600-lumen lamps to 18.3 mills for 15,000-lumen lamps.

Fuel clauses provide for increases for each 10 cents by which the fuel cost at the utility's plant exceeds $7.00 per net ton of coal, or equivalent fuel. These increases, for each 10 cents increase in fuel cost, range from 2 cents in the annual base price per lamp for 600-lumen lamps to 38 cents for the 15,000-lumen size. Changes of lamp location are at the city's cost.

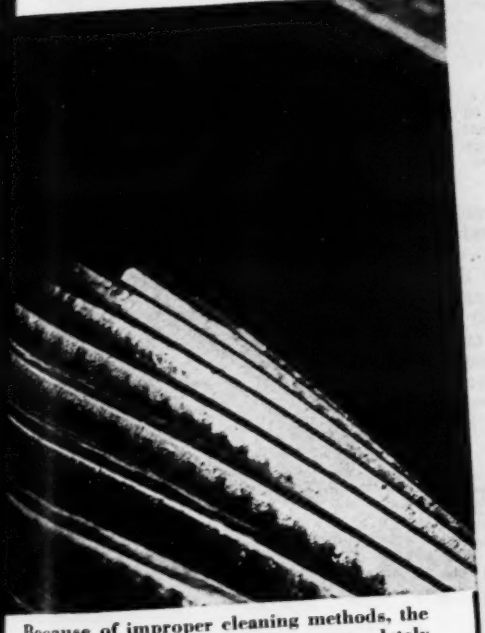
Don't send good turbine oil after bad—

CLEAN DIRTY OIL SYSTEMS!

'S WHAT HAPPENS TO
NE GEARS WHEN SYSTEM
OT PROPERLY CLEANED



oring of the gears, above, was caused by
etal chips left by insufficient cleaning at the
me of initial installation.



Because of improper cleaning methods, the oil in this system broke down completely after only six months of operation. Note severe wear on the gears caused by abrasive contaminants.

The New

SHELL CLEANING PROCEDURE

makes it easy...more efficient

IT HAS BEEN PROVED that the presence of a small amount of used turbine oil in a new fill may reduce the life of the new charge by as much as 50%! In addition, contaminants can cause excessive wear, improper operation of the governor, affect seriously the flow of oil to vital parts, interfere with the efficient transfer of heat in bearings and oil coolers.

Not only should *dirty* oil systems be cleaned, but the cleaning of *new* equipment is also necessary. In a new turbine, materials such as loose mill scale, metal chips, core sand, gasket compound, slushing compound, run-in oil and any rust that may have formed during the erection of the turbine, must be removed. They *can* be removed, and effectively, by new, Shell Turbo Cleaner, using Shell's Turbine Cleaning Procedure.

Before you add that next batch of oil to your system, be sure to get the details on Shell Turbo Cleaner and Shell's Cleaning Procedure. See your Shell man or send for your copy of the Turbine Cleaning Manual. Address: Shell Oil Company, Inc., 50 W. 50th St., New York 20, N. Y., or 100 Bush St., San Francisco 6, Calif.

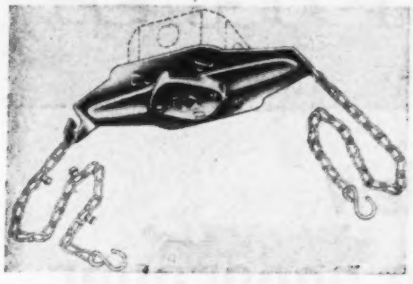
SHELL

SEND FOR THIS BOOKLET NOW!
Every turbine owner and operator should have a copy. It contains full details on the new Shell Turbo Cleaner and the Shell Turbine Cleaning Procedure. Shows you how simple and easy it is to keep your turbines clean...operating at peak efficiency.

SHELL TURBO OIL

NEW EQUIPMENT

Fixture Hanger



"Hydeal" hanger; two 6-ft. suspension chains; **Day-Brite Lighting, Inc.**, 5411 Bulwer Ave., St. Louis 7, Mo.

Hanger is said to serve a triple purpose by providing an outlet box cover with a receptacle, a means of supporting chain suspension fixtures, and a grounding arrangement so that fixtures furnished with two-wire cord and plug sets can be used. Said to fit open type plaster ring and all standard 3¼-in. or 4-in outlet boxes. Unit is complete with chains, cord clips, "S" hooks and receptacles.

•

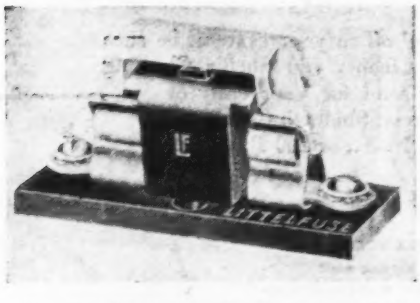
Electrode

Type W-55 electrode; a.c. or d.c.; three sizes 3/32 by 12-in., ⅛ by 14-in. and 5/32 by 14-in.; **General Electric Co.**, Schenectady, N. Y.

Electrode reported to be applicable for welding overhead and vertical welding from top down and from bottom up. Arc said to have sufficient force to keep slag from crowding the electrode when welding vertically downward.

•

Breakers



No. 156 Breakerette; 32 volts a.c. or d.c.; 1⅞-in. long by ¾-in. wide; wt. 18 gr. with hood; **Littelfuse Inc.**, 4757 Ravenwood Ave., Chicago 40, Ill.

Breaker is snap action said to be capable of interrupting short circuits of 1,000 amp. in ratings up to 5 amp. and 2,500 amp. in ratings over 5 amp. capacity. Developed to be interchangeable with 5 A G fuses. In operation, a double break of the circuit is effected when the bimetal releases the pushbutton on which it acts. The breaking distance is ⅛-in., to reset the button is pushed into its bottom position with respect to the case. Both trip-free and non-trip free features are obtainable.

•

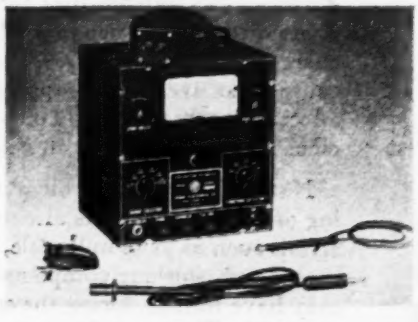
Resistor Core

Glazed steatite core; **Techman Industries, Inc.**, 828 N. Broadway, Milwaukee, Wis.

Steatite core of resistor is said to withstand salt water spray of several thousand hours. After 15 hours of immersion in a pressure chamber of 4,000 psi., the absorption is said to be less than $\frac{1}{10}$ of one percent. Electrical properties of the steatite core are: dielectric strength 198 v.p.m., flexural strength 14,600 psi., dielectric constant 5.65.

•

Volt-Ohm-Milliammeter

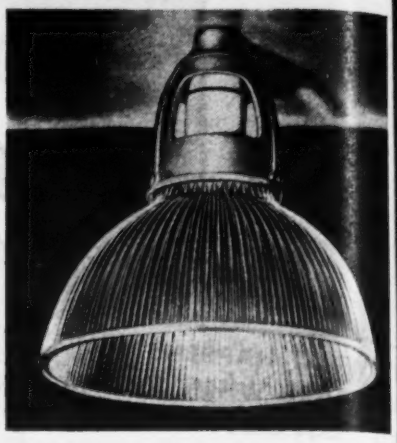


Vacuum tube volt-ohm-milliammeter; a.c. range 0.005 to 250 v., f. range 50 cps. to 50 mc.; d.c. range 0.005 to 250 v.; d.c. current range 50 mu a to 1 amp.; ohmmeter range 0.1 to 1,000 ohms; **Reiner Electronics Co., Inc.**, 152 W. 25th St., New York 1, N. Y.

Instrument which is said to save time in production testing. Stated to be useful in measuring amplifier gain, network response and output level. Voltmeter designed for measurements in audio, superionic and lower frequency regions. Said to be free from effects of moisture and temperature. Single zero adjustment. Supply voltage regulated. Battery is used for measurements below 100 ohms. Storage space is provided in the case for test probes and connectors.

BUYING ELECTRICAL EQUIPMENT?—McGraw-Hill's *Electrical Buyers Reference* is a convenient place to look first for manufacturers' product data, names and addresses.

Lighting Unit



"One-point-five" Lobay lighting fixture; three sizes of reflectors to accommodate 25 to 300-watt lamps; furnished with fitter for ½-in. pipe mounting or for 3¼-4-in. outlet box cover mounting. **Holophane Co.**, 342 Madison Ave., New York, N. Y.

Lighting fixture consists of a clear prismatic glass low bay reflector and screw type cast aluminum ventilated fitter. Adequate, even lighting is stated to be provided for spacings as great as 1.5 times the mounting height (max. 20 ft.) above the work. Lumen efficiency is 90 percent in the 0-180 deg. zone and shielding angle is 25 deg., it is claimed.

•

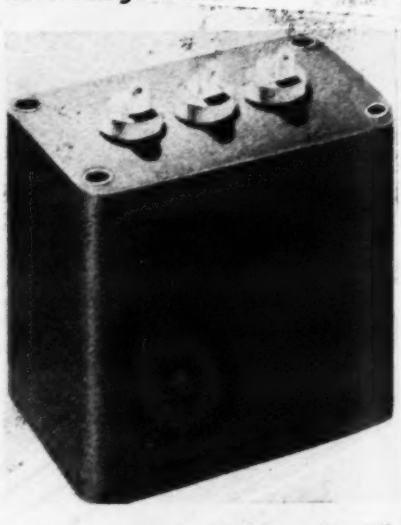
Safety Limit Stop

No. 20 safety limit stop for cranes; 230 v.; **Electric Controller & Mfg. Co.**, Cleveland, Ohio

Limit stop is of main circuit type; disconnects motor from line on d.c. cranes and brings hook to rest by dynamic breaking. May be used on a.c. cranes to disconnect hoisting-motor from circuit. Said to be suitable for indoor or outdoor installation.

•

Interstage Filter

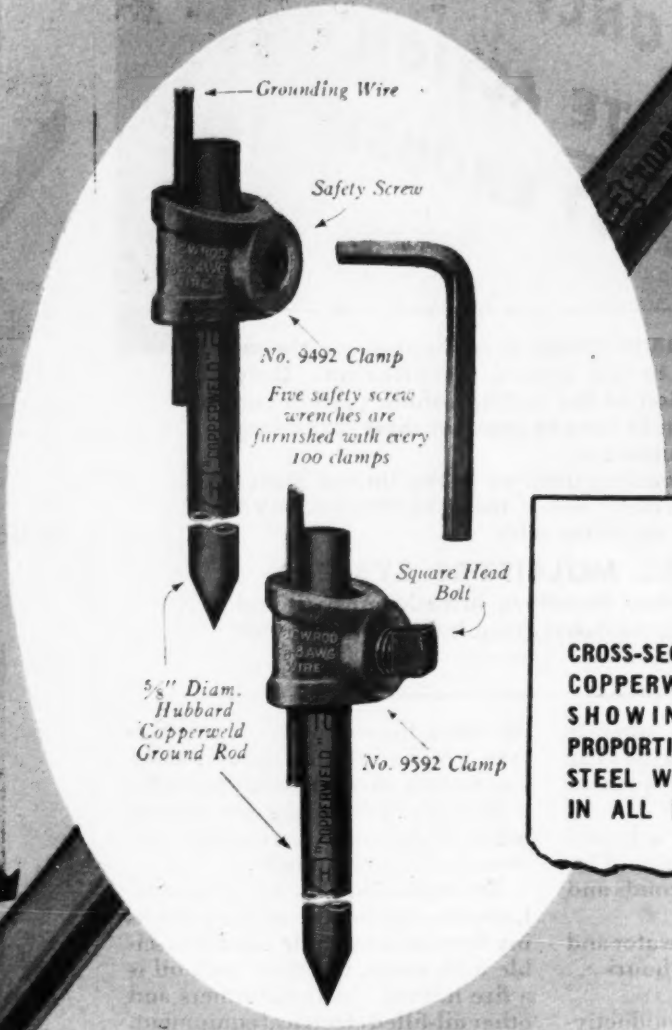


Interstage filter; frequencies 200 to 10,000 cycles; hermetically sealed case; size 1½ by 2½ by 2½-in.; **United Transformer Co.**, 150 Varick St., New York 13, N. Y.

Unit employs a dual alloy magnetic shield which reduces inductive pick-up to 150

HUBBARD-COPPERWELD

GROUND RODS AND CLAMPS


Grounding Wire
Safety Screw
No. 9492 Clamp
Five safety screw wrenches are furnished with every 100 clamps
Square Head Bolt
⅝" Diam. Hubbard Copperweld Ground Rod
No. 9592 Clamp

CROSS-SECTION OF A HUBBARD-COPPERWELD GROUND ROD SHOWING APPROXIMATE PROPORTION OF COPPER AND STEEL WHICH IS MAINTAINED IN ALL DIAMETERS OF ROD.

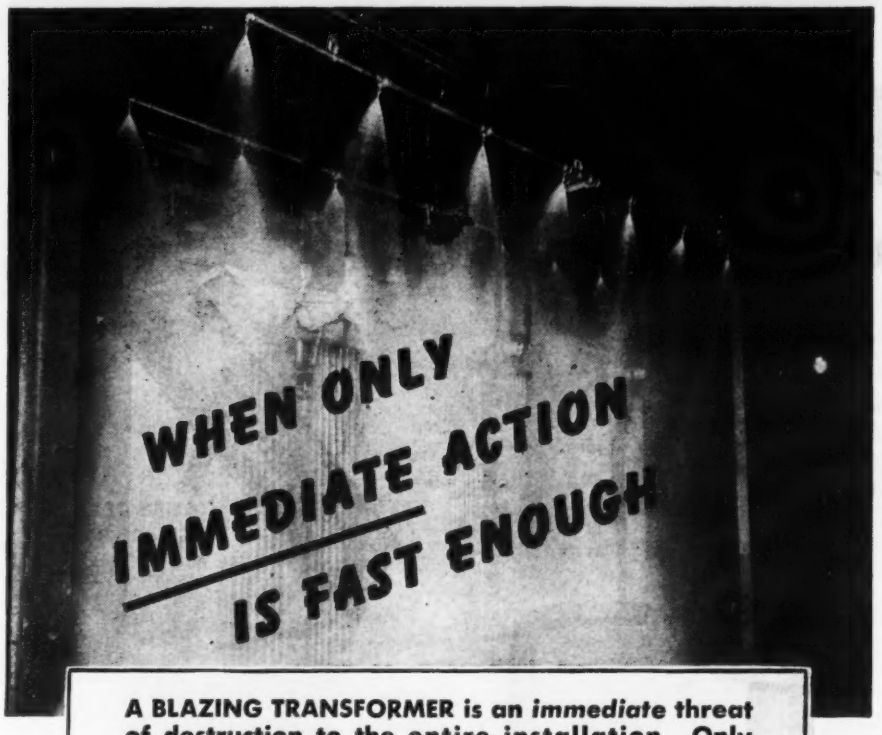
RODS—DIAMETERS FROM ⅜" TO 1"—LENGTHS FROM 5 FT. TO 40 FT.

CLAMPS—TWO STYLES, SAFETY SET SCREW AND SQUARE HEAD BOLT—FOR ALL DIAMETERS OF RODS.

HUBBARD AND COMPANY

EXCLUSIVE NATIONAL SALES AGENT FOR COPPERWELD GROUND RODS AND CLAMPS

PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA



A BLAZING TRANSFORMER is an *immediate* threat of destruction to the entire installation. Only *immediate* action of the extinguishing system can check the flames in time to prevent their spreading to adjacent equipment.

That's why leading utilities in the United States and Canada protect more than 10,000,000 KVA of transformer capacity with

GRINNELL MULSIFYRE SYSTEM

Numerous other Mulsifyre installations protect circuit breakers, switches, regulators, and similar oil-filled equipment.

MULSIFYRE SYSTEMS operate on the principle of emulsifying blazing oil with a driving spray of water.

The oil is turned into a liquid which is incapable of burning. Fire is extinguished in a few seconds and reignition is prevented.

Complete separation of water and oil takes place in a few hours . . . leaves oil undamaged.

There is absolutely no conductivity along the discharge of a Mulsifyre projector when spray strikes conductors carrying high voltages.

Mulsifyre Systems are permanently installed . . . they operate automatically or manually.

Recommended by Underwriters' Laboratories for use in extinguishing fires in flammable oils immiscible with water, wherever such oil is a fire hazard – in transformers and other oil-filled electrical equipment.

INVESTIGATE this simple, sure oil fire protection. Write for Data Book by Underwriters' Laboratories.

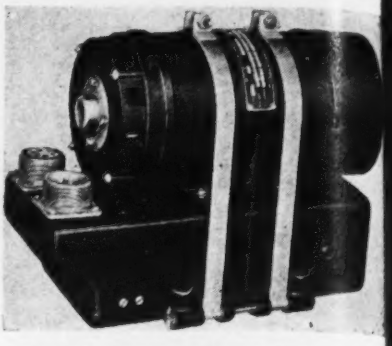
Grinnell Company, Inc.,
Providence 1, Rhode Island.
Branch offices in principal cities.

GRINNELL
MULSIFYRE SYSTEMS

Mv. per gauss. Type B.P.I. have prima impedance of 10,000 ohms and are designe to operate from the plate of a triode tu to a succeeding tube. Gain is said to b approximately 2 to 1. Type B.P.I. is d signed to operate from a line impedance 500 or 600 ohms to the tube grid. Gain is r ported to be approximately 9 to 1.

•

Motor Generator



Type 800 motor generator; input 75 amps. at 28-v. d.c.; output 10.5 mps. at 115-v. a.c.; pf. .9; single phase; 800 c.; continuous; Bendix Aviation Corp., Teterboro, N. J.

A d.c. motor and alternator with rotor on a common shaft. Carbon pile voltage regulator said to maintain a.c. supply o 115 volts over rated operating range of the set.

•

Ballast Capacitor

Oil-impregnated fluorescent ballast capacitor; The Capacitron Co., 318 W. Schiller St., Chicago 10, Ill.

Units are said to be built for continuous service at 85 deg. C. and to have less than 2 percent pf. at operating temperatures encountered in fluorescent ballasts. Process of mechanical sealing reported to eliminate high temperature oil leaks commonly caused by "solder blow."

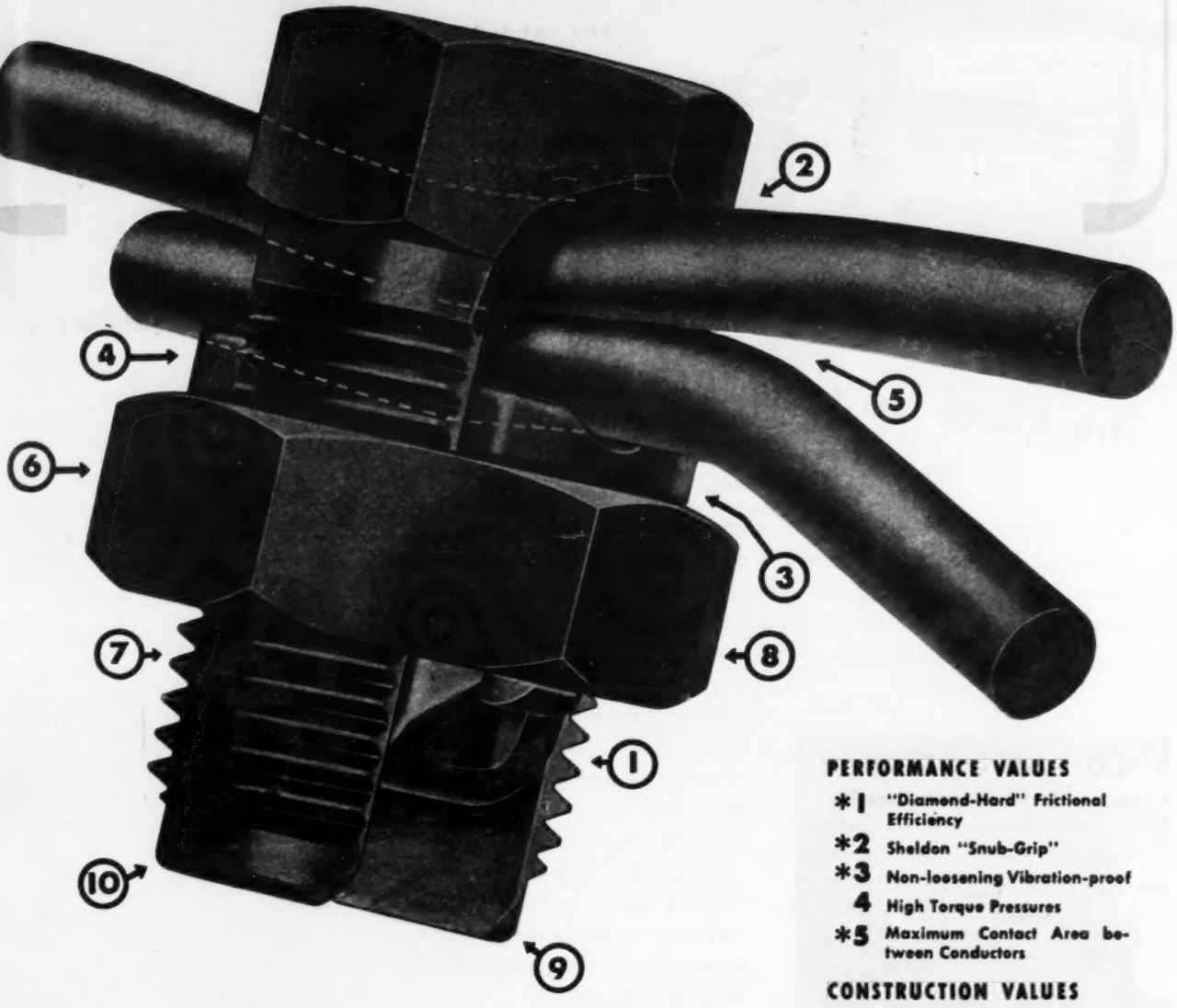
•

Transformer

Constant voltage transformer; cap. 15 va.; 60 c.; Sola Electric Co., 2525 Clybourn Ave., Chicago 14, Ill.

Stated to provide a single output voltage constant to within plus or minus one percent of rated requirements with line voltage variations up to plus or minus 15 percent. Said to have no moving parts, require no manual supervision or adjustment and

10 REASONS FOR SPECIFYING SHELDON SPLITBOLT CONNECTORS



PERFORMANCE VALUES

- *1 "Diamond-Hard" Frictional Efficiency
- *2 Sheldon "Snub-Grip"
- *3 Non-loosening Vibration-proof
- 4 High Torque Pressures
- *5 Maximum Contact Area between Conductors

CONSTRUCTION VALUES

- *6 Made of the Best Material Obtainable
- 7 Sheldon Precision Manufacturing Throughout
- 8 High-Tensile-Strength Alloys
- 9 Nickless Corners
- 10 Corrosion Resistant

*Exclusive Sheldon Features

SPLITBOLT connectors are operating equipment . . . and that's the way you should buy them! Check holding pressures . . . permanency of grip . . . machining precision . . . the host of factors that go into the manufacture of splitbolts. *Yes, check the ten features of Sheldon Splitbolt Connectors against any other make!* Sizes available: From 8 solid to 1,000 MCM. Write today for free testing samples. Sheldon Service Company, 652 Hudson Street, New York 14, N. Y.

Specify "Sheldon" for Precision-Built Electrical Connectors

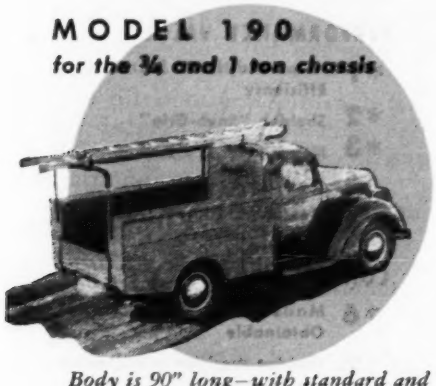
SHELDON SERVICE COMPANY

SPLITBOLTS . . . LUGS . . . COUPLERS . . . LIMITERS . . . CRABS

The ideal body for utility service and meter installation

● A "rolling workshop"—light, compact, sturdy and completely equipped, designed for efficient and economic service. All-steel construction—welded throughout—assuring longer life and low maintenance. Ample compartment space for tools, parts and equipment. Large, easily-accessible space for carrying meters, appliances, wire or other bulky material.

MODEL 190
for the ¾ and 1 ton chassis



Body is 90" long—with standard and optional features similar to those on model 175.

All doors have Baker Weathertight construction with key-locking handles—assuring safe, dry, dust-free compartments. Optional equipment includes sliding steel roof, partition trays, padded meter trays, pipe vise and bracket, and ladder brackets. Overall size 75" long, 69¾" wide, 41" high.

★ ★ ★

Write for Bulletin No. 50 for complete description of model 175, and Bulletin No. 45 for model 190.

THE BAKER RAULANG COMPANY
UTILITY BODY DIVISION
1282 West 80th Street • Cleveland, Ohio

Dependable AS THE SERVICE THEY HELP TO MAINTAIN

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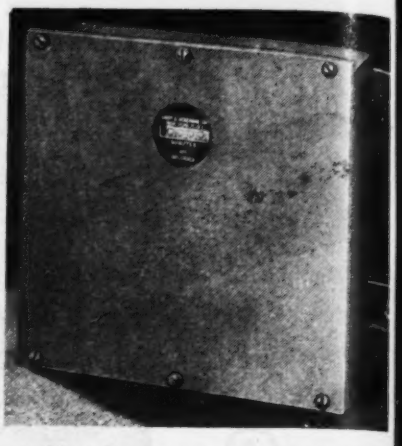
to be self-protecting against short circuit. Designed for through-chassis mounting and for such applications as heating and refrigerating controls, vacuum tube voltmeters, television, etc.

•

Arc Time Recorder



Arc time recorder; 110 v. 60 c. supply; recording range 99,999 min.; **Baier & Ackerman, Inc.**, 18 E. 41st. St., New York 17, N. Y.

Consists of a calibrated relay system which energizes a synchronous time-recorder only when the arc is on. Housed in a watertight sheet-steel enclosure which is said to permit installation directly on the welding generator or any other convenient space. Operates on voltage principle. Is said to "meter" the performance of each welding machine and operator on an equitable basis by totalizing the actual arc time in minutes.

•

Clamps

Clamp and locking tool; preformed and open-end types of clamps; range of sizes ¼ to 48-in. diameter, ⅜ and ½-in. band width. **Punch-Lok Co.**, 321 North Justine St., Chicago 7, Ill.

Banding, reinforcing and splicing of hose, cable ends, line taps, welding cable, split crossarms, guy wire guards, ground connections are some applications of a clamp consisting of a flat galvanized steel band or Everdur band double wrapped on a joint. After tensioning with a pull of 1,000 lb. in a locking tool the ends are locked together within a flat pressed-steel clip, and the excess broken off flush with the clip. It is stated that neither vibration nor rough handling can loosen it.

When the Lights go On★

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Here's the Remedy:

★ Reduces higher than rating line voltages, too. Swelling or sagging voltages are handled with equal ease by "LC" Transtat Line Voltage Compensators.

Dips and peaks in line potential need not disturb voltage-sensitive machines and devices. The AmerTran "LC" Transtat Line Voltage Compensators manually correct such fluctuations. They boost or buck voltage as needed. In fact, the "LC" Transtats combine most of the advantages of the famous "TH" Transtats with some that are peculiarly their own.

These advantages include lower cost per KVA of output and close control in increments as low as 0.2 volt without circuit interruption. Air insulated, designed for continuous operation indoors at full load, they are rated from 2 to 85 KVA, for nominal line voltages to 480, adjustment range ± 10% of line voltage. Also available for remote push-button control (LCM). Bulletin 51-2 contains a complete description, ratings, prices and suggested circuits. Write for it.

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MANUFACTURING SINCE 1901 AT NEWARK N.J.

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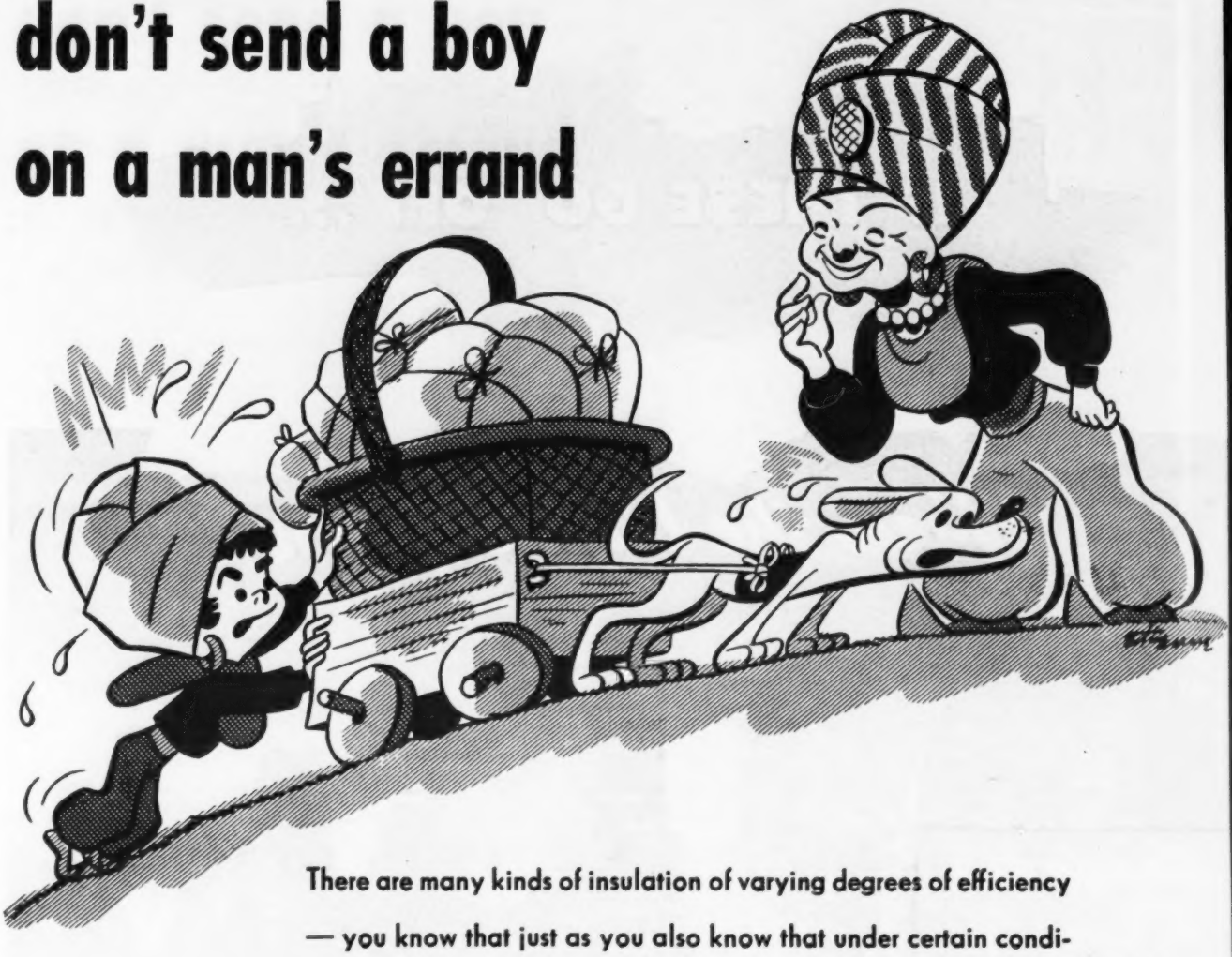
AMER-TRAN

don't send a boy on a man's errand



There are many kinds of insulation of varying degrees of efficiency — you know that just as you also know that under certain conditions many types of insulation cannot measure up to the responsibility — they may not break down all of a sudden, but they don't last long. Where mica ought to be used that's where nothing else will serve — no compromise.

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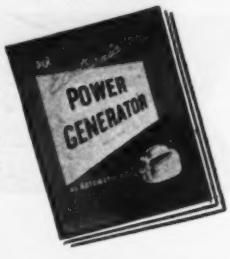

6 ***RCA 2000-Watt Electronic Generator*** (including special features for the Plastics Industry). A descriptive folder on this advanced automatic equipment.

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About Your Application: If you have a possible application for electronic heat, why not consult RCA engineers? A letter, stating your problem, will bring a prompt reply. Please address: RCA, Electronic Apparatus Section, Box 70-105F, Camden, New Jersey.

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2% LOSS FOR EACH REDUCTION

GEARMOTORS REDUCE LOSSES IN POWER TRANSMISSION

Gearmotors cut power transmission losses to the very minimum. So efficient is a gearmotor in transmitting power that not more than a 2% loss is involved in each gear set. This means that in its gearing parts a single-reduction unit is 98% efficient . . . a double-reduction gearmotor 96% efficient. Contrast this performance with the 60% to 75% power transmission efficiency of some other types of drives.

Here's a typical example of how gearmotors can cut power losses: On a flying shear application a 5 hp gearmotor was installed to replace the belt drive previously used. Result—power costs were decreased 10%, production increased 16%.

Less power loss in transmission assures *more* power for *production!* Ask your Westinghouse representative about this and the many other basic advantages of gearmotors. All of these are discussed in detail in the new gearmotor handbook, "Gearmotor Applications". Ask for B-3218. Westinghouse Electric & Manufacturing Company, P.O. Box 868, Pittsburgh 30, Pa.

J-07224

REASON NO. 1—GEARMOTORS SAVE SPACE
REASON NO. 2—GEARMOTORS SIMPLIFY SELECTION, ORDERING, DELIVERY
REASON NO. 3—GEARMOTORS SAVE INSTALLATION TIME AND EXPENSE

One of a series sponsored by Westinghouse to promote the use of gearmotors

Westinghouse

Type S—Double-reduction gearmotor available in standard ratios from 31.2:1 to 50.3:1, inclusive.
Type C—A double-reduction unit for standard ratios from 7.6:1 to 41.7:1, inclusive.
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10 CHECKING POINTS

WHICH EXPLAIN THE ADVANTAGES OF WESTINGHOUSE GEARMOTORS

1. FEWER PARTS TO WEAR. The simple, efficient design employs a minimum of moving parts.

2. BPT "TOUGH-HARD" GEARS AND PINIONS. This exclusive Westinghouse heat-treating method "tough-hardens" teeth for maximum resistance to shock and impact—means longer wear.

3. USE ALL WESTINGHOUSE MOTOR TYPES open . . . totally-enclosed . . . splashproof . . . explosionproof —to meet changes in operating conditions quickly and easily.

4. INTERCHANGEABILITY OF PARTS between unit types reduces your parts replacement stock by 40%.

5. HIGH EFFICIENCY of gearing parts assures full motor horsepower at output shaft . . . only 2% power loss for each gear set.

6. POSITIVE LUBRICATION of gears and bearings by automatic splash system reduces probable maintenance to twice-a-year change of oil.

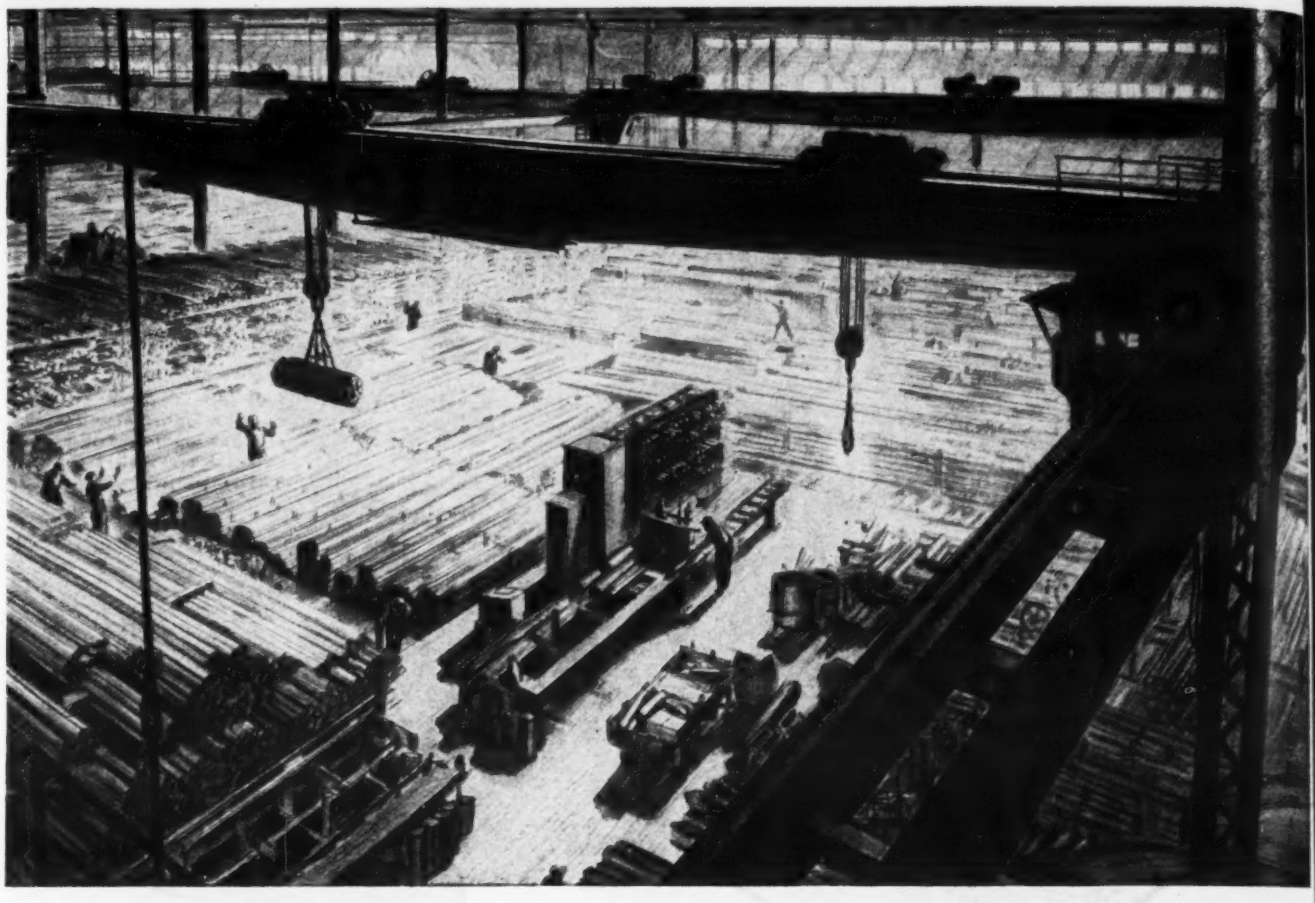
7. EASY ACCESSIBILITY. Gearing parts can be readily inspected or easily removed to make gear ratio changes.

8. IMPROVED FOUNDATION STABILITY. Feet are under the gear case . . . placing support next to the gearmotor load. Each foot is reinforced by external ribs.

9. UNIT RESPONSIBILITY for design . . . manufacture . . . and service. Westinghouse builds both motor and the gears.

10. MEET A. G. M. A. STANDARDS. Westinghouse Gearmotors are specifically designed and built to meet A.G.M.A. standards . . . easy to order and match to the job.

Gearmotors



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JOSEPH T. RYERSON & SON, INC.

RYERSON STEEL-SERVICE

NEWS ABOUT PEOPLE

Engineering Assignments Made by Roller-Smith

Roller-Smith has recently announced several new appointments to its engineering staff.

Dr. A. C. Bates, until recently associate professor of mechanical engineer-

A. C. Bates

ing in charge of under-graduate and graduate courses in machine design at Lehigh University, has been made chief engineer. George C. Stehle has been appointed production planning engineer and W. J. Cherones has been named instrument engineer.

Mr. Bates' work has included considerable industrial research experience in the Bell Telephone Laboratories, Inc., where he specialized on standardization and development work; the Purdue University engineering experiment station; research work on vibration, and as laboratory engineer with the Studebaker Corp. of America. Before going to Lehigh University, he was on the teaching staff of the University of Pennsylvania. He is the author of a number of engineering publications and is a member of the American Society of Mechanical Engineers and of the Society of Automotive Engineers.

Mr. Stehle was formerly connected with the Hudson Motor Car Co. and the Bendix Aviation Corp., in both connections engaging in material control, scheduling and planning, as far as production is concerned.

Mr. Cherones was formerly chief civilian engineer of Central Station Fire Control and Computing Gunsights Department at the Army Air Force Headquarters in Dayton, Ohio. After his graduation from the University of Illinois, Mr. Cherones was a member of the Ford Motor Co.'s electrical engineering staff until 1942, when his services were accepted by the Army Air Force.

•

▶ Dr. Adam S. Bennion, long prominent in civic, education and business affairs of Utah, again has been appointed assistant to the president of the Utah Power & Light Co. He resigned this position last June to become Republican candidate for the U. S. Senate.

▶ Clarence L. Alliman of Pottsville, Pa. has resigned as chief system operator of the Pennsylvania Power & Light Co. to move to Washington, D. C., where he will be affiliated with a Federal agency. Mr. Alliman had been with P.P. & L. 24 years and will be succeeded by Joseph Malloy.

▶ T. J. Robertson, manager of the Craighead Rural Electric Cooperative Corp., which operates throughout northeast Arkansas, has resigned to become chief of the Operations Division of REA in St. Louis. Mr. Robertson had managed the Arkansas co-op four years. For 13 years previously he had been engineer for several utility companies.

▶ W. C. Allen has been appointed purchasing agent for Utah Power & Light Co. to succeed A. D. Smith, who is retiring after 42 years' service. Mr. Allen has been employed by Western Colorado Power Co., Durango, Colo., and Utah Power & Light Co. for 24 years. Mr. Smith who is one of the best known purchasing agents in the west, was honored by members of the Purchasing Agents' Association of Utah and a group of sales managers at a dinner held in the Newhouse Hotel in Salt Lake City.

Anaconda Wire Announces Appointments to Staff

J. W. Mullally has resigned as chief of the wire and cable branch of the copper division of the War Production Board to resume his work as manager

Chase-Statler

J. W. Mullally

of bare and weatherproof sales of the Anaconda Wire & Cable Co. with headquarters in New York. Mr. Mullally will continue with WPB as consultant for a limited period.

Announced at the same time was the appointment by Anaconda of J. L. Tin-

J. L. Tindale

dale as special representative on rural line extensions. Mr. Tindale, until his release with an honorary discharge, was a Lieutenant (j.g.) in the United States Navy. He saw active service in the South West Pacific theater.

•

▶ Victor G. Muzsnay has been appointed as electrical engineer, consultant, and technical advisor for the Bonneville Power Administration's Puget Sound district office and Lawrence J. Parker industrial engineer for the mid-Columbia district. Before joining the

One stroke brings shoe into position

ONE MAN can bend pipe *fast* with a GREENLEE Hydraulic Pipe Bender. It takes but a few minutes to get smooth, precise, uniform bends — simply and easily.

For example, as illustrated, one stroke of quick-positioning lever brings shoe snug against pipe, ready for application of bending pressure. Tedious hand-pumping for shoe positioning is eliminated with this GREENLEE-engineered "short cut". You're now ready to transfer handle to operating lever and apply powerful hydraulic pressure for the exact bend you want—immediately!

Whether you're bending pipe, rigid and thin-wall conduit, bus bars, tubing—*from* ¾" *to* 4½"—you'll find it simple as A. B. C. with a GREENLEE. This means important labor and material savings on every bending job—large or small.

Get the entire story on GREENLEE Benders and other time-saving tools for electrical workers. Write for Catalog 33E — free — Greenlee Tool Co., Division of Greenlee Bros. & Co., 1812 Columbia Ave., Rockford, Illinois.

OTHER GREENLEE TIME-SAVING TOOLS FOR ELECTRICAL WORK:

CABLE PULLERS
JOIST BORERS
HAND BENDERS
RADIO CHASSIS PUNCHES
PIPE PUSHERS

Get Ready with Greenlee!

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FOR THE CRAFTSMAN

Bonneville staff, Mr. Muzsnay was i Philadelphia where he served for s years as chief electrical engineerin draftsman for the Fourth Naval Distri naval yard. He was born in Czechosl vakia and received his degree i electrical engineering at Bruen Czechoslovakia. He has worked in ce tral station and transmission syste design and construction work in Europ and the United States. Mr. Parke born in Seattle, Wash., and trained i electrical engineering and business a the University of Washington, has bee with the West Coast regional office o the U. S. Maritime Commission at Oa land, Calif. Previously he served 1 years as industrial power engineer fo the Pacific Gas & Electric Co. at Sa Francisco.

Bailey Meter Appoints Dickey Chief Enginee

P. S. Dickey has been appointe chief engineer of the Bailey Meter Co. Cleveland, Ohio. Mr. Dickey will sup

P. S. Dickey

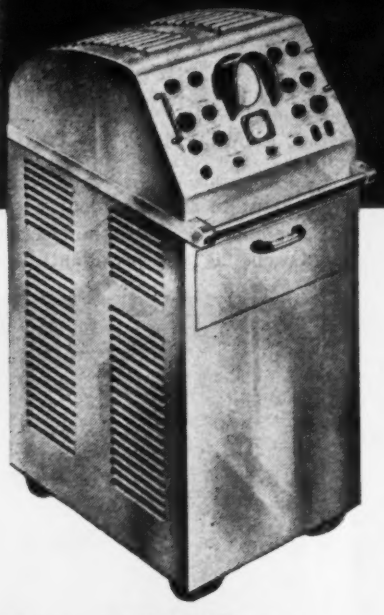
ervise all engineering, research and de sign activities for the company. H will be assisted by H. H. Gorrie, assis ant chief engineer and R. E. Clar manager of contract engineering.

A graduate of Purdue University, M Dickey has served Bailey Meter C continuously in various engineering ca pacities since his graduation in 192 In his former position of research engi neer, he has conducted numerou studies here and abroad on the prob lems involved in the control of bot forced and natural circulation boiler in stationary, marine, and mobile serv ice. He has to his credit numerou patents, and is the author of technica papers and articles on measuremen and control as applied to power an process operations.

Mr. Gorrie, who has been appointe assistant chief engineer, has been ass

RCA MEASURING INSTRUMENTS FOR LABORATORY AND FIELD

Please note that deliveries of these instruments are subject to regulations of WPB General Scheduling Order M-293.



RCA TYPE 715-A LABORATORY-TYPE OSCILLOSCOPE

With Triggered Sweep and Time-base Marker

Vertical amplifier flat to 10 m.c. with a sensitivity of .1 volt r.m.s. per inch.

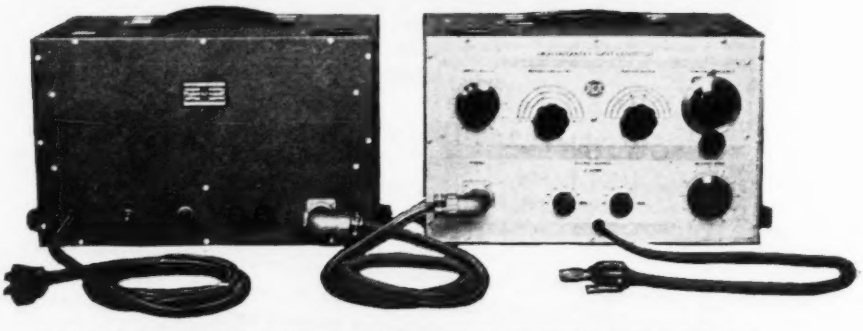
RCA TYPE 327-A D.C. OSCILLOSCOPE

Ranges from 100 kilocycles to zero cycles. 9-inch tube.

Uses direct coupled amplifiers having a low-frequency characteristic that holds good all the way down to zero frequency (d.c.). Equipped with 9-inch tube.

CA ULTRA-HIGH FREQUENCY SIGNAL GENERATOR TYPE 710-A

requency range, 370 to 560 megacycles. idely used for checking high-frequency evices. Provides smooth and complete ttenuation throughout its range, plus recision frequency control.



RCA HIGH-FREQUENCY WIDE-BAND SWEEP GENERATOR TYPE 709-B

Covers the frequency band of 5 to 65 megacycles (center frequency). Ideal for high-frequency I. F. curve response study. Calibration marker permits constant checking of band width characteristics.

RCA BULLETINS containing complete descriptions and specifications of any of these instruments will be sent on request.

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. . . and here's why SIL-FOS and EASY-FLO are ideal for brazing in the ELECTRICAL field

CONDUCTIVITY—SIL-FOS and EASY-FLO make joints that are as high in electrical conductivity as the parent metals. That's why they are ideal for joining lugs, leads, terminals, taps, coils, contacts and other current-carrying connections.

STRENGTH—SIL-FOS and EASY-FLO make joints that equal or exceed the metals joined in strength. That's why they are ideal for structural jobs in motors, switches, instruments and other electrical equipment.

DUCTILITY—SIL-FOS and EASY-FLO make joints that have the ductility to withstand severe vibration, shocks and temperature changes. That's why they are ideal for electrical or structural jobs likely to be subjected to these conditions.

CORROSION RESISTANCE—SIL-FOS and EASY-FLO make joints that offer high resistance to many corrosive agents and do not deteriorate in electrical efficiency. That's why they are ideal for bus bars, switchboards and other electrical connections.

LOW TEMPERATURE—SIL-FOS and EASY-FLO have low flow points (1300°F. and 1175°F.) That's why they minimize the possibility of injuring metal structures and are ideal for joining light wires and thin metals.

ECONOMY—The low working temperatures and extreme fluidity of SIL-FOS and EASY-FLO combine to save labor, materials and finishing, resulting in a surprisingly low cost per joint—not the least of the reasons why these alloys are ideal for electrical work.

BULLETIN 12-A will give you full details about SIL-FOS and EASY-FLO (originated by Handy & Harman) and how to put them to work in your plant. Write for your copy—now.

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ciated with the Bailey Meter Co. c
tinuously since 1927. He was forme
manager of the company's San Fr
cisco branch office and later head of
control engineering department.

Mr. Clark has completed more t
20 years service with the Bailey
ganization in the capacities of field
gineer, meter engineer and automa
control engineer.

•

Elliott Co. Makes Two New Appointmen

Appointment of Frank H. Stohr as
sistant to the president of Elliott C
Jeannette, Pa., and the election of R.
Owens as vice-president in charge

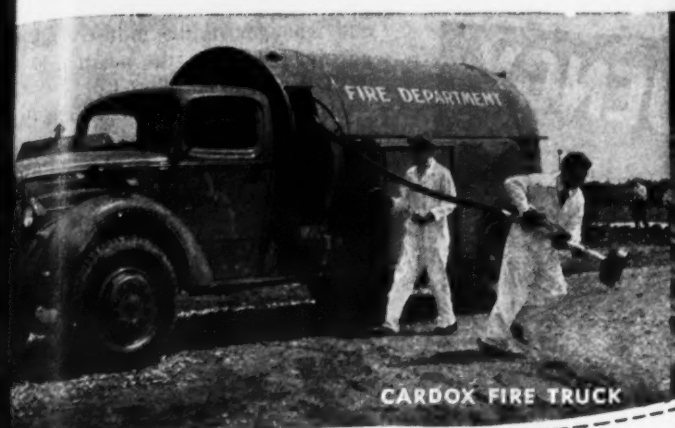
F. H. Stohr

manufacturing are announced.

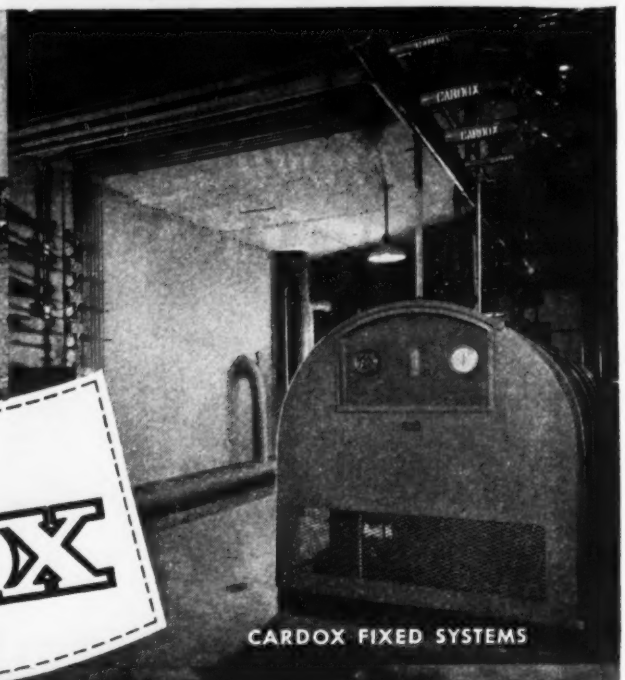
With Westinghouse Electric & Ma
facturing Co. since his graduation
electrical engineering from the Univ

R. W. Owens

sity of Iowa in 1922, Mr. Stohr
made manager of the generator s
section in 1926. Successively, he becam
sales manager of the generating d
sion, manager of the generating a
tran-portation manufacturing divisi



CARDOX FIRE TRUCK



CARDOX FIXED SYSTEMS

FIRE PROTECTION By CARDOX

CARDOX AIRPORT FIRE TRUCK

and around America's vital war plants , on our big and busy military air-lds . . . fire protection is provided by rdox Fire Extinguishing Systems, Fire ucks and Airport Fire Trucks.

Each is a highly specialized fire extin-shing tool . . . exactingly engineered do a specific job quicker and more ctively than it has been done before. t all Cardox Systems and Mobile Units e one outstanding characteristic in mmon: *Cardox Engineering in the ap-ication and control of carbon dioxide, ed at 0° F. and 300 p.s.i. in a single rage Unit containing from ¼ to 125 s of fire-destroying Cardox CO_2.*

For Cardox has given the recognized vantages of carbon dioxide a new and ader scope of fire extinguishing per-rmance. Because of this, these advan-ges can be applied equally well to small very *large* fires through *mass* applica-n of Cardox CO_2, released in *pounds* tons.

The efficiency of Cardox Systems and Mobile Units in giving fast-acting, non-damaging carbon dioxide *enhanced extinguishing* performance is made possible by Cardox methods of control and application that give Cardox CO_2: (1) Uniform extinguishing characteristics regardless of plant or atmospheric temperatures; (2) Availability in ample quantity for uninterrupted protection and mass application at high rate; (3) High CO_2 "snow" yield for increased cooling effect; (4) Effective projection through relatively great distances.

On the basis of this performance Cardox has been given many of the toughest fire protection assignments—*all over the country*. Find out how through practical cooperation Cardox and its engineering staff can assist you to make your planned fire protection more effective. Write on company letterhead for Bulletin 5124.

CARDOX CORPORATION

BELL BUILDING • CHICAGO 1, ILLINOIS

District Offices in New York • Boston • Washington
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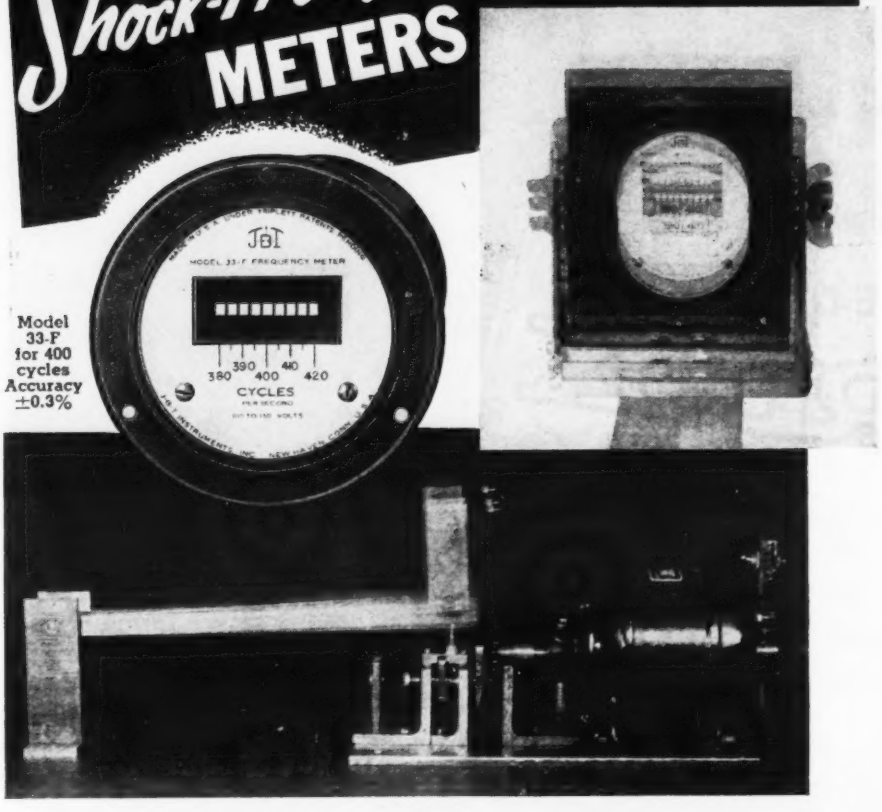
CARDOX

CO_2 FIRE EXTINGUISHING SYSTEMS

Shock-Proof FREQUENCY METERS



Mechanical shaking — one hundred and twenty times a minute through a one inch stroke for a full hour—on this Government bronco

...a rough ride for any instrument—but J-B-T Vibrating Reed Frequency Meters take this slamming in stride—with accuracy unaffected. They're rugged.

During the run, meters are rotated in the clamp to subject the reeds to stress and shock not only in their normal plane of operation but also in cross planes. They also undergo 24 hour vibration tests and single impact shocks of 50 G's and above—through all planes.

Here's where the designer's specifications of base inserts, lock washers at every critical point, polymerized finish, and similar precautions prove their worth.

For technical data on the complete line of J-B-T Vibrating Reed Frequency Meters, send for VF-43 with supplements.

J-B-T

(Manufactured under Triplett Patents and/or Patents Pending)

12-JBT-2

J-B-T INSTRUMENTS, INC.

439 CHAPEL STREET • NEW HAVEN 8, CONNECTICUT

and manager of the industry sales department in 1939, the position he held until joining the Elliott Co.

Mr. Owens joined the Elliott Co. as assistant to the president early this year, having previously had a wide experience of some 28 years in the design and manufacture of electrical products.

•

New Assignments Made by Westinghouse C

Westinghouse Electric & Manufacturing Co. has recently announced the re-appointment of W. O. Lippman as manager of the company's electric appliance division works, East Springfield, Mass., a position he relinquished in April, 1943, to become manager of the Canton, Ohio, ordnance division. Mr. Lippman will retain his ordnance division position and will divide his time between the two plants. In his absence from the Canton plant, J. Smith, newly appointed manager of manufacturing there, will be responsible for the operation of the division.

Appointment of R. W. Beil as general contract manager of the company has also been announced. In his new position Mr. Beil will be stationed at East Pittsburgh. He was formerly at the Sharon, Pa., Works where he was supervisor of order service for the transformer division of the company.

A. W. Lohr has been appointed acting manager of the market development department, during the absence of Donald C. Hooper, who is now in the U. S. Navy. A graduate of the University of Michigan, Mr. Lohr has been with Westinghouse since 1930, holding positions in commercial research, new products and market development.

Appointment of W. Ross Arbuckle as manager of the home building department was announced by T. J. Newcomb, sales manager of the Westinghouse Electric Appliance Division, Mansfield, Ohio. He will develop a merchandising program on planned kitchens and laundries for homes and apartments and expand the company's activities on major appliances in the apartment and multiple housing field. Mr. Arbuckle has been with Westinghouse since 193

•

▶ Robert M. Hatfield, Jr., of Cleveland, formerly chief of the boiler section of the Office of War Utilities' power division, will head a special WPB "task group" which will endeavor to boost the production of spare parts for internal combustion engines used in heavy duty trucks, landing craft and other Army and Navy equipment. Mr. Hatfield left WPB some months ago after moving from the boiler section job to the directorship of the program scheduling

READY—IN 17 SECONDS

REPRODUCTIONS OF YOUR DRAFTSMEN'S DRAWINGS, TYPED MATERIAL, OFFICE FORMS

In this case, the operator is feeding a draftsman's pencil drawing, size 17" x 22", and a piece of sensitized paper into the machine. Smooth-running conveyor belts speed both materials around the printing cylinder . . . after which the drawing is automatically released, and the exposed paper goes up and across the dry-developing tank.

Here comes the Ozalid print . . . an exact duplicate—not a negative, of the original. You'll find it dry, ready for immediate use. And there's a very unique reason for the short time required—only 17 seconds . . . and for the fact that the print has black, or red, or blue lines on a white background—whichever color was desired.

WHY YOU MAKE PRINTS WITH THIS SPEED AND VERSATILITY

THE ANSWER is in OZALID DRY DEVELOPMENT . . . and what it has allowed designers and chemists to do.

Since only one developing operation is employed, the design of an Ozalid machine is extremely simplified. *So* compact in size you can install it in a corner of the drafting room or office. *So* easy to understand that any inexperienced person can quickly learn to turn out prints with maximum efficiency—using cut sheets or roll stock.

Also consider the amazing line of sensitized materials which react only to the *dry* principle . . . and offer this choice whenever you want to reproduce anything drawn, typed, printed, or photographed on translucent material:

• **Black, Red, Blue Line** standard papers which allow you to assign identifying colors to prints of different departments, to distinguish checked from unchecked prints, etc.

• **Transparent Papers, Cloths, Foils** which you use to produce Intermediate Originals and Composite Prints or to reclaim worn or soiled drawings.

• **Opaque Cloths** which give you prints of exceptional durability.

• ***NEW* Dryphoto Papers** which produce beautiful reproductions with all the halftone details, from photographic film-positives or perspective drawings.

See all of these Ozalid Prints yourself—and learn the complete story.

Write for "Simplified Printmaking" today.

ARMY NAVY

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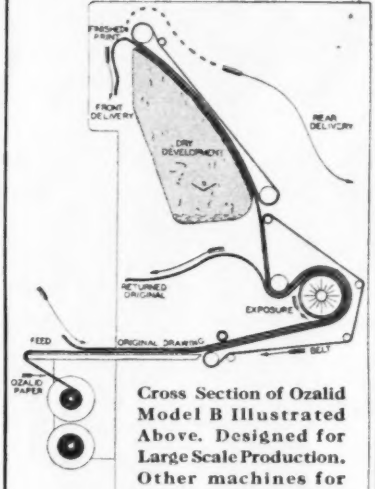
Division of
General Aniline and Film Corporation

Johnson City, New York

Ozalid in Canada—
Hughes-Owens Co., Ltd., Montreal



Cross Section of Ozalid Model B Illustrated Above. Designed for Large Scale Production. Other machines for lighter production or for use with blueprint equipment. Same *dry* principle, same advantages.

● A recent survey indicated that 2,000,000 rural homes not wired could use electricity to advantage. Of these, 400,000 are near existing lines and 1,600,000 will have to be served by new lines.

The building industry is talking in terms of 1,000,000 new homes a year for the first five years after the war. This means a vast increase in line load in urban communities.

This construction indicates a huge backlog of demand for telephone service.

Discount these figures as you will—the fact remains that public utility companies face a big program of line construction after the war.

Klein tools and equipment will be ready for the linemen and electricians working on this expansion program. The Klein line of tomorrow will continue to offer the same high quality—the same regard for safety that has characterized all equipment carrying the name Klein "since 1857."

ASK YOUR SUPPLIER

Foreign Distributor:
International Standard Electric Corporation, New York

This book on the care and safe use of tools will be sent without charge upon request.

division and was commissioned a lieutenant in the Navy. Released from the Navy, he will serve on his new assignment as special assistant to Harold Boeschenstein, Deputy Vice-Chairman for Operations.

•

Engineering Assignments Made in Philadelphia

Philadelphia Electric Co. has just announced several new engineering appointments. L. R. Gaty, assistant electrical engineer since 1940, was appointed acting electrical engineer, electrical engineering division, and C. Farrell was appointed assistant electrical engineer of that division. H. Dambly was made engineer, system planning, transmission and distribution section, electrical engineering division, succeeding Mr. Farrell and A. H. Kidder was made assistant engineer in charge of special investigation and testing division, succeeding Mr. Dambly. F. J. Berger was named assistant engineer, system planning, transmission and distribution section, electrical engineering division.

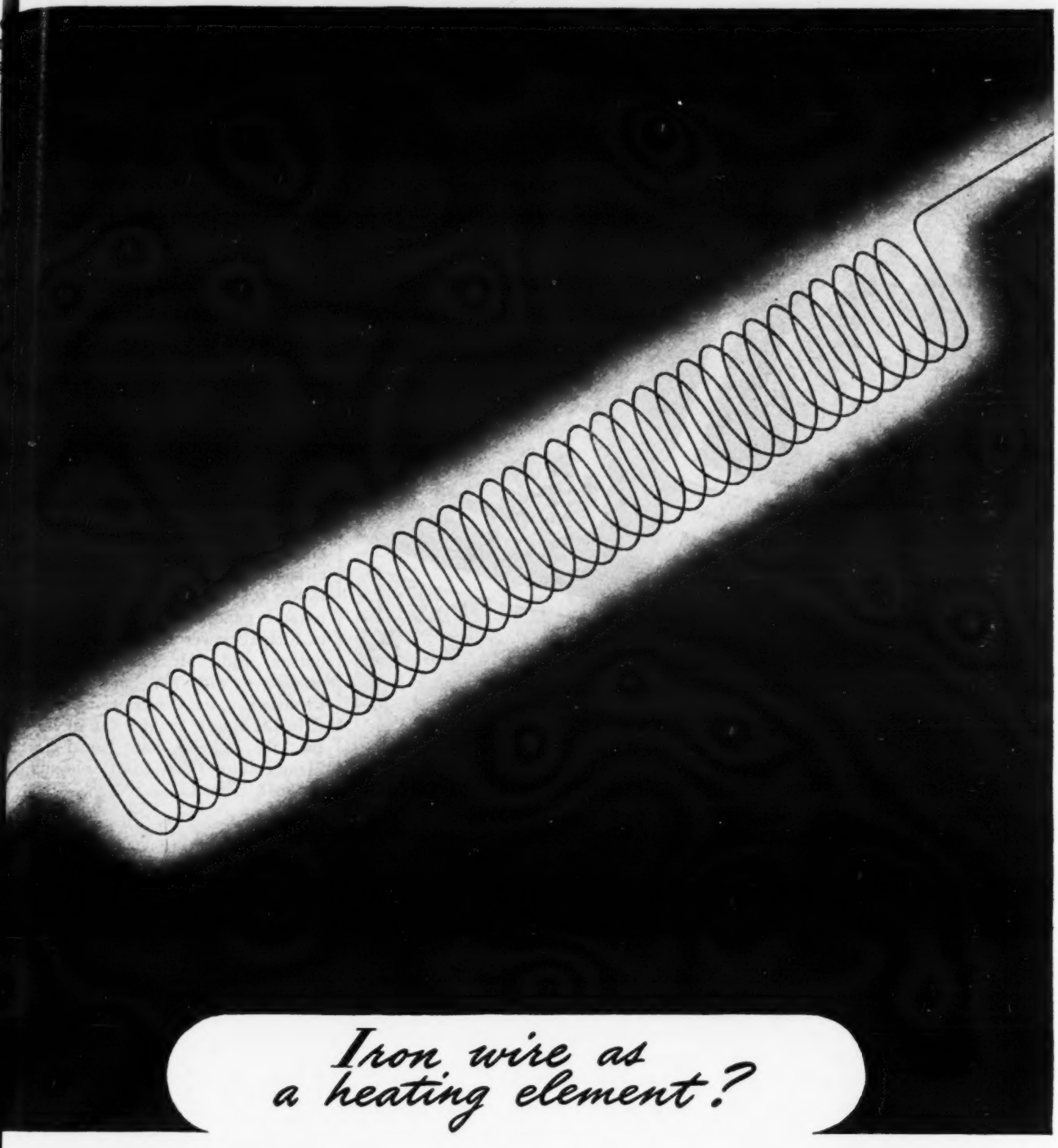
Following graduation from Cornell University, as an electrical engineer, Mr. Gaty became identified with the Sioux City Gas & Electric Co. He was transferred to the Counties Gas & Electric Co. at Norristown in 1926 and became superintendent of electrical distribution. Following a series of other assignments, each with increasing responsibilities, Mr. Gaty was named assistant electrical engineer of the Philadelphia Electric Co. in 1940.

Mr. Farrell became identified with the Philadelphia utility in 1921. He has filled many responsible positions, including assignments as superintendent of service maintenance, superintendent of underground lines, superintendent of overhead and underground lines, superintendent of estimating and detailing and engineer in charge of system planning.

Mr. Dambly received his engineering education at Pennsylvania State College and Massachusetts Institute of Technology. He was employed by the Philadelphia Electric Co. in 1923, and had advanced to the position of assistant engineer in charge of special investigations at the time this latest change was announced.

A graduate of Massachusetts Institute of Technology, Mr. Kidder was advanced through successive promotions to the position of assistant engineer, system planning, transmission and distribution section, electrical engineering division, the position he held at the time of his recent appointment.

Following gradutaion from Lehigh University in 1925, Mr. Berger became



Iron wire as a heating element?

Yes, iron wire might be used as a heating element, but at very low temperature indeed. If it ran at red heat, it would burn out in a jiffy, as you well know. All other wires (except platinum) likewise burned out too soon, until Chromel was discovered, back in 1906. It's easy to take Chromel for granted, because it ranks with a lot of other good things. We talk about it, merely to keep you mindful that Chromel just about did create the heating device industry, and made electric heat practical and useful in so many ways. For technical data on Chromel, ask for Catalog-M.

Chromel
NICKEL CHROMIUM
HOSKINS CHROMEL
ELECTRICAL HEATING ELEMENT
WIRE

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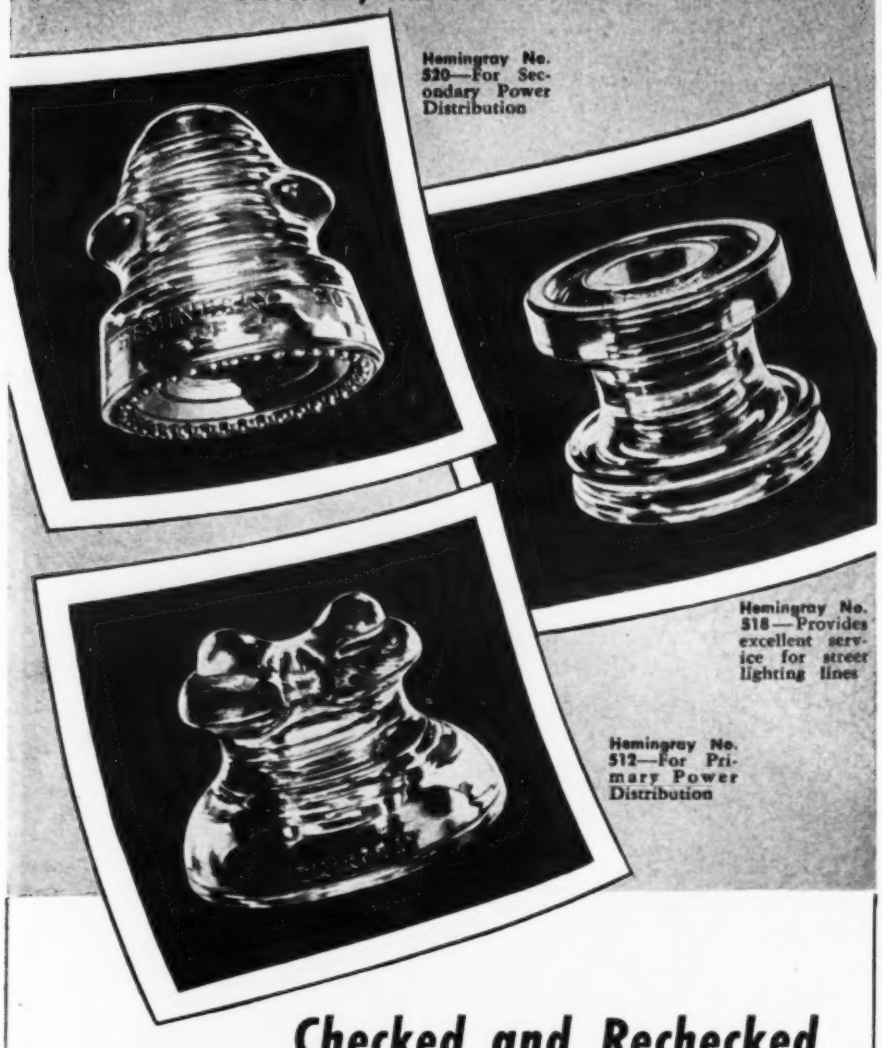
Favorably Known Since 1870


Hemingray No. 520—For Secondary Power Distribution
Hemingray No. 518—Provides excellent service for street lighting lines
Hemingray No. 512—For Primary Power Distribution

Checked and Rechecked

. . . All Along the Line!

Hemingray Insulators are made under careful supervision—under exacting step-by-step quality production control. That's why they're so *tough* and *strong*—so *dependable*.

Try them! The cost is low to begin with—lower in service-life.

There are ten Hemingrays for Primary Power distribution for voltages from 2,300 to 15,000 and manufactured in accordance with suggested specifications of the Edison Electric Institute.

There are ten Hemingrays for Secondary Power distribution with Heights ranging from $2\frac{15}{16}$ to $5\frac{1}{32}$ inches and Diameters ranging from $2\frac{1}{4}$ to $3\frac{1}{4}$ inches.

Investigate! Hemingrays are sold by principal jobbers and are manufactured by Owens-Illinois, Hemingray Division, Muncie, Ind.

OWENS-ILLINOIS

HEMINGRAY INSULATORS

Telephone-Telegraph

Export Agents: International Standard Electric Corporation, New York City

associated with the Philadelphia Electric Co. in the transmission and distribution department. He was senior engineer in the system planning, transmission and distribution section, immediately prior to his recent promotion.

▶ RAY E. BRENNAN, for the past 13½ years, treasurer and comptroller of Portland General Electric Co., Portland, resigned from this position on December 1 to join the Pacific-Atlantic Steamship Co., Portland, as assistant to the president. Prior to going to Portland Mr. Brennan was associated with utility properties in New York. Before that he was on the Chicago staff of Haskins & Sells and with the United Public Service Co., Chicago. He is the president of the newly formed Portland Control of Controllers Institute of America.

▶ FRANK C. YARLING, formerly senior electrical engineer in charge of transmission and distribution of Indianapolis Power & Light Co., recently resigned to become general superintendent of the municipal power and light system, Anderson, Ind. Mr. Yarling has been associated with the Louisville Gas & Electric Co., the Girdler Corp. of Louisville, the Public Service Co. of Indiana, Inc., the Indiana State Rural Electric Membership Corp. and Indianapolis Power & Light Co.

▶ LEE G. JOHNS has severed his connection with the Central States Power & Light Corp., West Union, Iowa, after sixteen years of service. Central States Power & Light has been purchased by the Interstate Power Co., Dubuque. Mr. Johns was serving as new business manager and assistant secretary at the time of the sale.

▶ KYLE D. WILLIAMS of Albany, Mo., has been named chairman of the Missouri Public Service Commission to succeed Albert Miller of St. Louis, who resigned because of ill health.

▶ ROBERT M. FELSENTHAL has been named manager of the radio, phonograph and appliances division of the international department of the RCA Victor Division, Radio Corp. of America. HUBERT H. KRONEN, formerly an RCA Victor regional manager and export specialist, was made sales manager for the division. Mr. Felsenthal, a merchandising executive for Sears, Roebuck & Co., and its export organization, Sears International, before joining RCA in 1942, will direct distribution abroad of the company's radio receivers and record-playing instruments and also of

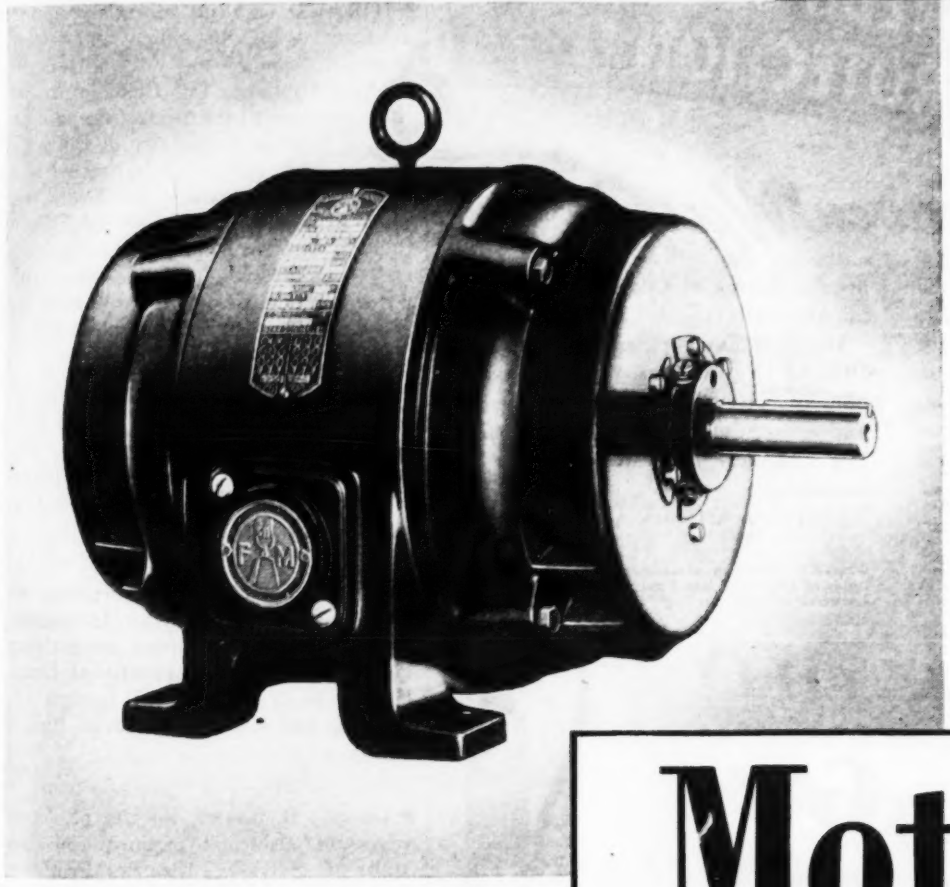
"A name worth remembering"

Fairbanks-Morse

To search constantly for ways to improve is a basic Fairbanks-Morse policy. Development work goes on continually in our research laboratories—in good years and bad, in time of peace and in time of war. During the months and years ahead this research will yield a rich harvest to users of industrial equipment.

R. W. Morse Jr.

General Sales Manager



FEATURES OF THE NEW

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GENERAL-PURPOSE MOTOR

- It is a 40° C. motor.
- It is a protected motor.
- It has an optional conduit box assembly.
- It has cross-flow ventilation.
- It has ball bearings, sealed in and protected.
- It has the exclusive Fairbanks-Morse *Copperspun Rotor*.

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Farm Equipment

BUY MORE WAR BONDS

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This Proven Way!

Wherever there's an electrical fire hazard or other fire hazards involving flammable liquids or gases—those are the spots for DUGAS fire extinguishing equipment, charged with PLUS-FIFTY DUGAS Dry Chemical.

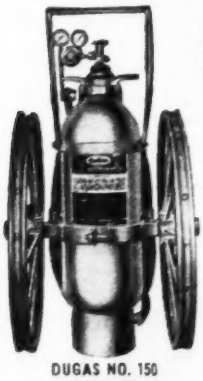
PLUS-FIFTY DUGAS Dry Chemical works fast in knocking out such fires. The very split-second it strikes flames, fire-smothering gases are released—and the fire is OUT.

Harmless to equipment, PLUS-FIFTY DUGAS Dry Chemical is non-abrasive, non-corrosive and non-toxic. And most important of all—PLUS-FIFTY DUGAS Dry Chemical is a non-conductor of electricity.

Send for new Dugas catalog.

Approved by Underwriters' Laboratories and Factory Mutual Laboratories.

CHART showing characteristics of all types of approved hand fire extinguishers sent free on request.



DUGAS NO. 150 WHEELED EXTINGUISHER

DUGAS NO. 30-T HAND EXTINGUISHER

ANSUL CHEMICAL COMPANY, MARINETTE, WISCONSIN
DUGAS DIVISION

a line of household appliances. J. A. MIGUEL has been appointed general manager of RCA Victor Mexicana, the RCA subsidiary company in Mexico, with headquarters in Mexico City; and J. M. KERBEY, formerly vice-president and treasurer of the Argentine subsidiary company, as manager of international accounts and finances at RCA Victor Division's Camden, N. J., headquarters. Mr. Miguel succeeds H. R. MAAG, who resigned to assume new duties in RCA's domestic regional sales organization. The resignation of J. M. REGOTTAZ, export manager, has been announced. After long association with the RCA international sales organization, he is planning to establish himself in private business.

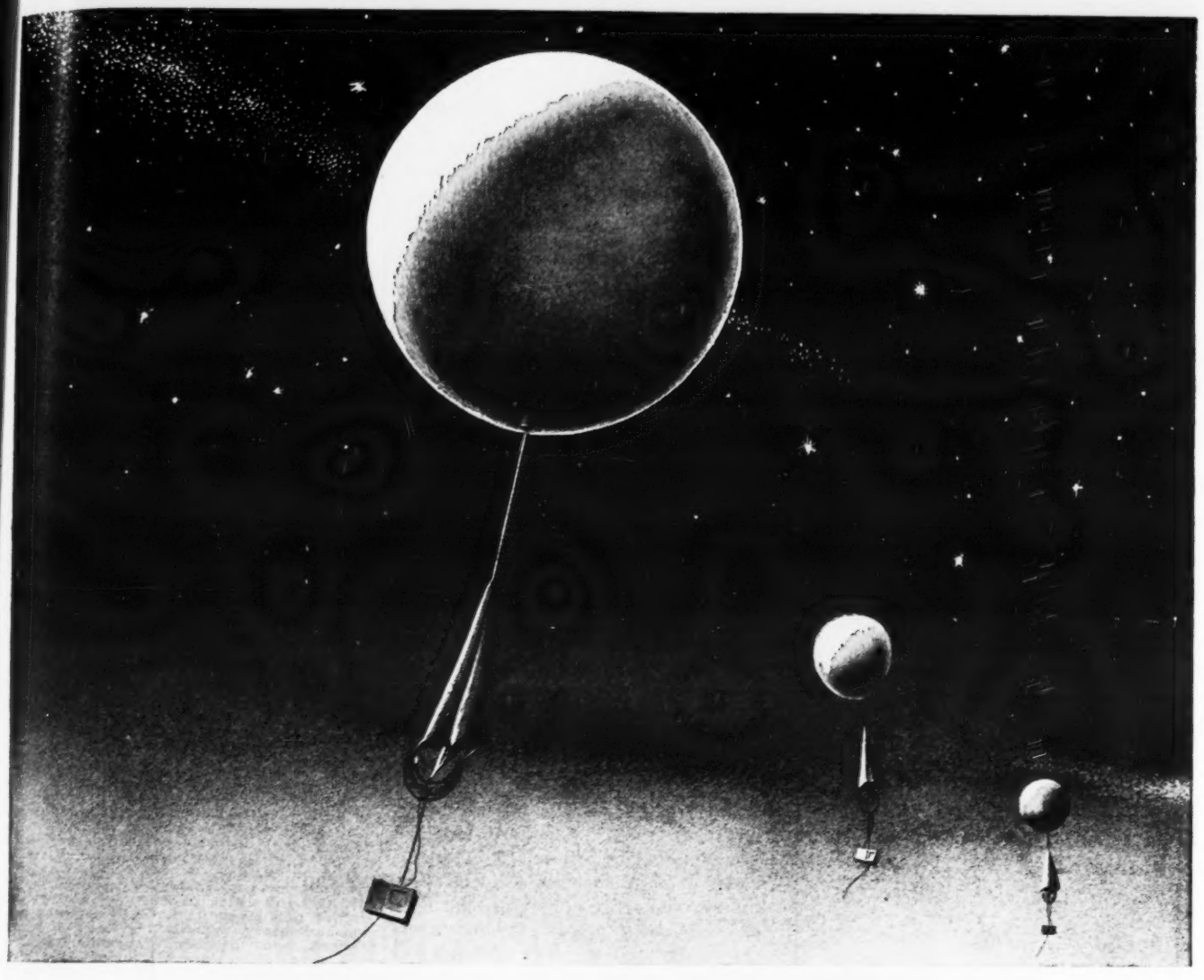
▶ WHEELOCK WHITNEY, formerly regional director of the Division of Local Transport for the Office of Defense Transportation, and more recently assistant regional director in charge of passenger operations, Cleveland, has resigned to rejoin the Northern States Power Co., Minneapolis, Minn., and will be division manager at St. Cloud.

▶ HAROLD D. CONKLIN recently resigned as manager of the range and water heater division of the Edison General Electric Appliance Co., Chicago, to become manager of the electric range division of Admiral Corp., also of Chicago. Mr. Conklin goes to Admiral with a background of sixteen years electric range experience. He joined the Edison General Electric Appliance Co. in 1928 as assistant manager of the range and water heater division. He was also for a time west coast regional manager.

▶ RHOADES V. NEWBELL, formerly in charge of sales promotion for the Edison General Electric Appliance Co., Inc., Chicago, has been named advertising manager of the Magnavox Co., Fort Wayne, Ind.

▶ OVID RISO, formerly advertising director of Great American Industries, Inc., has been appointed advertising manager of Philco International Corp. He will be in charge of all foreign advertising and sales promotion of Philco products.

▶ GEORGE B. GRANT, for the past two years an electrical engineer on the staff of Sylvania Electric Products Inc., has been appointed sales engineer in New England for the Thomson-Gibb Electric Welding Co., with headquarters at Lynn, Mass. Mr. Grant was connected with the Thomson-Gibb company for about 16 years prior to joining the Sylvania organization.



FARTHEST FRONTIER OF MANKIND

. . . 132,000 FEET UP

AT this very moment, men may be getting messages direct from the sky 25 miles above the earth's surface. Scores of "radio-sondes" make nightly balloon ascensions into the stratosphere. One reached the fantastic altitude of 132,000 feet!

The radio-sonde is a compact radio sounding unit, borne aloft by balloon and returning to earth by parachute. It contains delicate instruments for measuring temperature, pressure, humidity, other phenomena vital for weather forecasting. It contains, too, radio equipment for transmitting this information to receiving sets on the ground.

How would you test the radio-sonde under actual working conditions?

In test chambers, General Electric air conditioning and refrigeration equipment help reproduce the strange, unearthly "weather" of the mid-stratosphere . . . air of extremely low absolute humidity . . . with temperatures ranging down to —100° . . . air so thin it exerts a pressure less than 1/100 of the atmospheric pressure at sea level!

Creating stratosphere weather was another tough job, another exacting wartime problem for G-E engineers.

In solving many of these problems, we've made air conditioning and refrigeration equipment more compact, more flexible, more efficient—adaptable to the postwar requirements of *more users*. Investigate! Write: *General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Section 4412, Bloomfield, N. J.*

☆ **BUY . . . and hold . . . WAR BONDS** ☆

Air Conditioning by

GENERAL ELECTRIC

Hear the General Electric Radio Programs: The "G-E ALL-GIRL ORCHESTRA," Sundays, 10 p.m., E.W.T., NBC . . . "THE WORLD TODAY" News, Every Weekday, 6:45 p.m., E.W.T., CBS

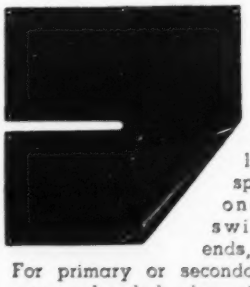
Safety is the lineman's watchword north — south — east—and west. Surety gives complete confidence and comfort through extra-tough, easy-to-wear protective rubber equipment.

SURETY TURN-CUFFS

with the petticoat insulator effect minimize surface creepage ... turned down they add two welcome inches of protective gauntlet. SAFEST, EASIEST to WEAR!

NON-BINDING SLEEVES

Tough, but not bulky in front. High voltage stock gives maximum protection and long field service. You pay no more for this sturdy, adjustable sleeve.



SLOT-TO-CENTER BLANKETS

Made especially for covering spool and secondary wires, switches, dead ends, transformers. For primary or secondary lines. 45" square, beaded edge, nine eyelets.

THE Surety RUBBER COMPANY
CARROLLTON, O

OBITUARY

Judge Edward C. Eicher

Judge Edward C. Eicher, for ten months chairman of the Securities and Exchange Commission, died last week in the midst of a months-long trial of 26 persons charged with conspiracy to undermine the morale of the Armed Forces.

Eicher was elected to Congress in 1932 from the First Iowa District, serving until November, 1938, when he resigned to become a member of S.E.C. He was chairman for his last ten months on the commission, resigned therefrom to accept a federal judgeship on the U. S. District Court for the District of Columbia, of which he was Chief Justice at his death.

Judge Eicher was a native of Iowa and a graduate of the University of Chicago.

▶ HENRY A. DYKEMAN, 67, since 1931 assistant to the president of the Toledo Edison Co., died in Toledo November 25 of a heart ailment.

▶ WILLIAM STUSSY, 68, former superintendent of power for the Montana Power Co., died November 11 as the result of an automobile accident. Mr. Stussy, who retired this year, had been associated with the company and predecessor organizations since 1900 and had held the position of superintendent of power since 1913. A native of Minnesota, Mr. Stussy graduated from the University of Minnesota with a degree in electrical engineering and was in charge of electrical construction projects for the Missouri River Power Co., predecessor of Montana Power, for several years.

▶ SVEN R. BERGMAN, for 42 years an electrical engineer with the General Electric Co. and a co-worker of the late Charles P. Steinmetz and Prof. Elihu Thomson, died on November 25 of a heart attack at his home in Nahant, Mass., in his sixty-seventh year. Mr. Bergman was the holder of numerous patents on electrical machinery and during the present war had been specializing in generating equipment for aircraft. A native of Sweden, Mr. Bergman was graduated from the Royal Institute of Technology at Stockholm and took post-graduate work at the Karlsruhe (Germany) Electrical Institute. He came to the United States in 1902 and immediately obtained employment with General Electric. Mr. Bergman is a member of the American Institute of Electrical Engineers.

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STANDARD HANDBOOK for ELECTRICAL ENGINEERS

Archer E. Knowlton, Editor-in-Chief

Associate Editor for Engineering, Electrical World

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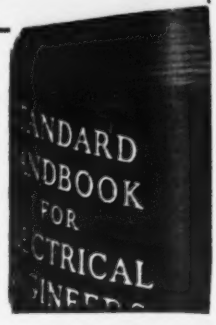

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Thousands of useful facts in these

26 BIG SECTIONS

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Power System Electrical Equipment
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Power Distribution
Wiring Design—Commercial and Industrial Buildings
Illumination
Industrial Power Applications
Electric Heating and Welding
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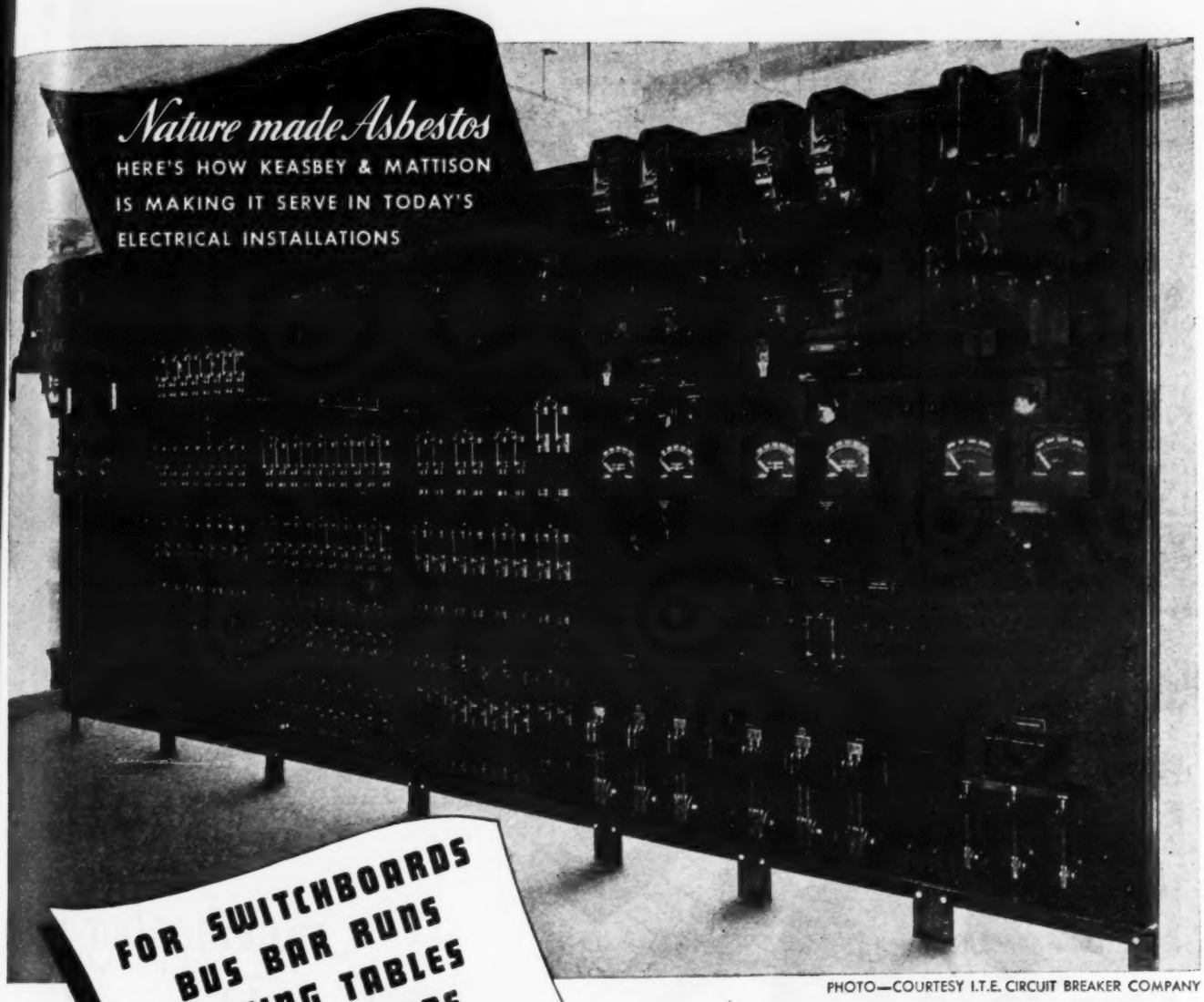

Nature made Asbestos

HERE'S HOW KEASBEY & MATTISON IS MAKING IT SERVE IN TODAY'S ELECTRICAL INSTALLATIONS

PHOTO—COURTESY I.T.E. CIRCUIT BREAKER COMPANY

FOR SWITCHBOARDS
BUS BAR RUNS
TESTING TABLES
PANEL BOARDS

use K&M EBONIZED ASBESTOS

Here's why! K&M Ebonized Asbestos is made especially for modern electrical insulation requirements. It consists of a perfectly proportioned combination of asbestos fibre, binding cement, insulating compound, molded under intense pressure into strong monolithic sheets.

Note these special features of K&M Ebonized Asbestos . . .

Exceptionally high dielectric strength.

Uniform density throughout.

Withstands severe shock, vibration and wide temperature variation.

Resists oil and water action.

Does not shrink, crack or bulge.

Expanded production facilities make K&M Ebonized Asbestos available for *immediate delivery*. Comes in thicknesses from 1/8" to 4", standard or special "panel" finish. Specially developed to meet technical requirements of the Underwriters Laboratories, Inc., when built into an assembled unit. For further information, write us.

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K&M
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Another big rush on Long Distance lines this Christmas...

It was a big rush last year. It may be even bigger this Christmas.

So please help keep Long Distance lines clear for essential calls on December 24, 25 and 26.

War still needs the wires — even on holidays.

BELL TELEPHONE SYSTEM

YEAR-END REPORT

What WE *are doing to help* YOU

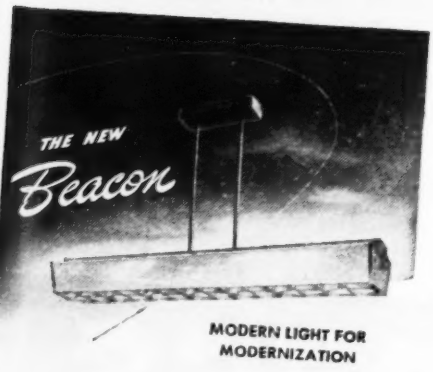
Heretofore we have been offering you suggestions for postwar. Now our postwar plans are just about completed . . . and *here's what you can count on from us:*

1. **Engineered lighting recommendations** with high level lighting. This means help in maintaining or building load for you.
2. **Salable products.** We have retained one of America's foremost industrial designers, the Van Doren organization, to add eye-appeal to Wakefield product efficiency.
3. **Advertising** that will help create a desire for better lighting among school, office and store people . . . and we hope, for Wakefield equipment.
4. **Readily available products** through our use of national distributing houses, such as Graybar Electric Company and the General Electric Supply Corporation and leading independent distributors.
5. **Convenient help** from our sales engineers, located strategically throughout the United States.
6. **Production facilities** to meet the expanding market . . . through plant enlargement and new production equipment.
7. **Sales tools** such as specialized bulletins, booklets, mailing pieces and other helpful material.

And, of course, we will continue to bring you any thoughts which we believe will help you with your problems.

Sincerely,

A. F. Wakefield



MODERN LIGHT FOR MODERNIZATION

One way we can work with you now . . . .

Wakefield lighting equipment is engineered for top efficiency and for pleasing overall effect. But we believe that's only part of a good lighting job. And that's why Wakefield is always glad to work with you for engineered lighting installations. Typical of the Wakefield units that can help you on essential jobs now is the BEACON. Modern and clean-lined in design, it provides high quality light at lower cost. Rigid louvers hinged for easy maintenance. Foolproof sockets help prevent accidents. Write for details.

Wakefield

THE F. W. WAKEFIELD BRASS COMPANY • VERMILION, OHIO

"We Reduced Production Delays By Installing BUSS Super-Lag FUSES. Now We Use Them Exclusively"

Reports **M. J. HYMEL,**
Purchasing Agent,
Service Foundry, Inc.,
New Orleans, La.

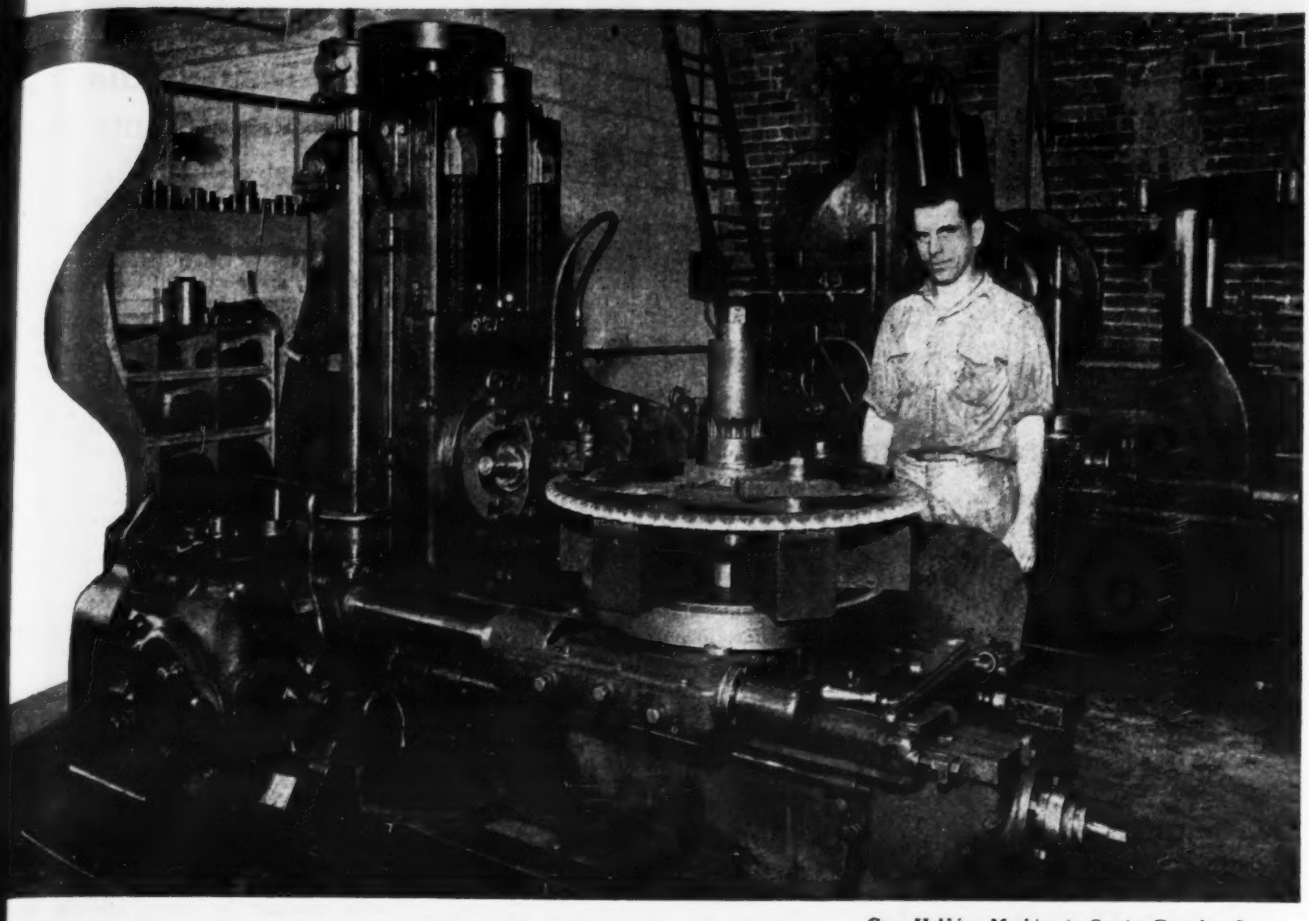
"About two years ago," says Mr. Hymel, "our electric motors were frequently shut down because fuses were blowing on motor starting loads. These shutdowns were costly—causing interruptions that cut production, disrupted scheduling, and made it difficult to meet delivery promises.

"A wholesaler's salesman had the right answer to our problem when he recommended that we discard our old fuses and use only Buss Super-Lag fuses. Since that time we have completely eliminated fuse blows due to motor starting loads. This convinced us. We have standardized on BUSS, because they have eliminated our troubles."

Why BUSS Fuses Don't Blow Needlessly

10 FEATURES in the design of the FUSE-CASE help make it possible. *and* ***The SUPER-LAG*** development in the FUSE-LINK completes the job.

★★★ **BUSS**



Gear Hobbing Machine in Service Foundry, Inc.

Here is another outstanding example that demonstrates how Buss Super-Lag fuses are helping to keep production running smoothly, how they reduce lost man-hours, and save trouble and grief for electricians and maintenance men.

If you have a problem similar to the one at Service Foundry, Inc., doesn't this example indicate how you can profit by the use of Buss Super-Lag fuses?

Buss fuses require no maintenance or periodic inspection. They don't open needlessly. If one opens, you can be sure some condition needs correction. When one opens, it requires less than 45 seconds to renew with an inexpensive link.

Why BUSS Fuses greatly reduce or entirely prevent needless blows

The fuse case is designed to insure good contact on the link, even when the fuse is renewed by an inexperienced person—and it is so designed that vibration or heavy overloads or the constant heating and cooling of the fuse will not permit poor contact to develop. Thus excessive heating, which causes fuses to blow needlessly, is prevented.

The fuse link used is the famous "BUSS Super-Lag." It has lag-plates attached to it. These give it a time-lag so long that it will reduce to an extent not possible with any other renewable fuse, the number of shutdowns caused by needless fuse blows.

Prevent future trouble in your plant—by doing this today

Pass the word along that all purchase records dealing with circuit protective devices should be immediately changed to call for BUSS Super-Lag Renewable fuses. Then, as fuses are replaced or new installations made, your plant will automatically get the benefit of the care-free, trouble-proof protection that BUSS Super-Lag fuses afford.

BUSSMANN MFG. CO. • ST. LOUIS 7, MO.

Division McGraw Electric Company

Super-Lag FUSES SOLD THROUGH WHOLESALERS

MANUFACTURING MARKETS

Complete Post-War Reconversion Plan

Westinghouse Electric & Manufacturing Co. has completed plans for post-war conversion to civilian production when victory is won, A. W. Robertson, chairman, reported at a recent meeting of the company's directors.

While no provision has been made for any major new plant construction in the post-war program, Mr. Robertson said Westinghouse now has approximately 12 percent more manufacturing space than in 1939 and this "should prove adequate for some time to come since we plan to operate on a two-shift basis after the war."

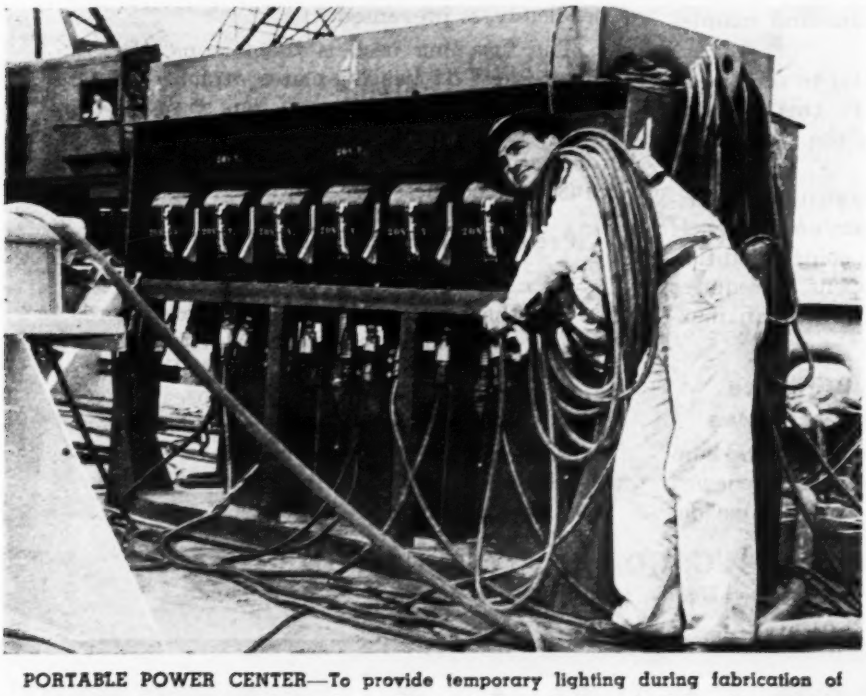
October shipments of the company amounted to $75,028,866, a record for 1944, and comparing with $63,113,578 in October, 1943. During the first ten months of 1944 production amounted to $687,128,457 in net sales billed, against $566,650,674 in the corresponding period of 1943.

Mr. Robertson continued: "Our backlog of unfilled orders is still $621,852,556 and all our plants are filled with war work. That is why the only post-war work that can be done now is planning, and our plans have been made. Westinghouse is definitely postponing any effort to put its plans for reconversion into practice at this time."

•

Status of Dugas Changed

Ansul Chemical Co., Marinette, Wis., has announced that its subsidiary, Dugas Engineering Corp., has become the Dugas Division of the parent company. The change, which conforms with Ansul's post-war development and future planning program, encompasses the complete operations of Dugas. It also makes possible a measure of simplification and standardization.



PORTABLE POWER CENTER—To provide temporary lighting during fabrication of a vessel at Permanente Metals Corp., Shipyard No. 2, Richmond, Calif., this portable power center is placed on the ship. Three General Electric Co. kva. dry type transformers, located in the bottom of the center, take 440 primary voltage and provide either 208 or 110-volt power at the secondary. Use of the unit makes possible lighting of inaccessible nooks of the ship

New District Sales Appointments Made

Electrical manufacturing companies have recently announced the following appointments to their sales staffs:

Line Material Co., Milwaukee, has named Maurice Dusenberry Salt Lake City district manager. Mr. Dusenberry was supervisor of Utah Power & Light Co.'s commercial and industrial sales department for the past five years and was connected with the department for 14 years. Wilbur F. Smith, who formerly covered the Salt Lake area for Line Material, working out of Denver, has been appointed to Denver district manager.

Allen-Bradley Co., Milwaukee, has appointed E. B. Dewey as sales representative in Kalamazoo. He will cover southwestern and central Michigan. Mr. Dewey was for fourteen years resident engineer for Century Electric Co. For the past four years he has maintained his own office and represents several manufacturers of electric equipment.

I-T-E Circuit Breaker Co., Philadelphia, has appointed J. Fred Getz manager of the company's Washington, D. C., office at 910 Fifteenth Street, N.W. Mr. Getz is well known in the electrical industry, having been sales manager of Roller-Smith, Bethlehem, Pa., and prior to that was with the General Electric Co. for eight years.

Apex Electric Manufacturing Co. has appointed L. D. Stull as western division sales manager to direct sales in eleven western states. Mr. Stull's western division sales offices are located in the Furniture Mart Building, San Francisco.

•

Triangle Conduit Gets AAF "Approved" Rating

Triangle Conduit & Cable Co., Inc., of New Brunswick, N. J., has been assigned an "Approved" Quality Control Rating by the Army Air Forces, Air Technical Service Command.

The "Approved" rating denotes that each department of the plant and each inspection operation therein is properly organized and controlled and that the company's inspection system is so efficient that duplication of inspection during detail fabrication by Air Corps personnel can be eliminated.

•

New Blackening Process

Ferrotoning, a new, simpler chemical blackening finish for ferrous parts, has been developed by Turco Products, Inc., Los Angeles, Calif. This new process utilizes simple immersion equipment which can be set up quickly in small manufacturing or plating plants with equipment that is already available or obtainable at very small cost. The Ferrotone bath operates at a temperature considerably below that required by oxide finishing baths.

WIRE to TOKYO

The Signal Corps is getting it through mile by tortuous mile

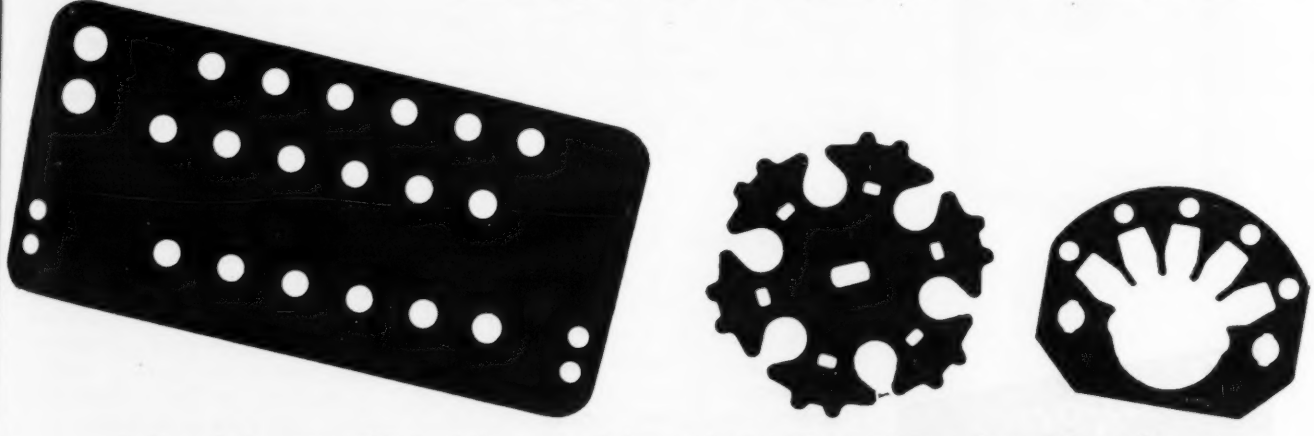
COMMUNICATIONS

Must get through . . . in spite of cold, heat, humidity, dryness, or the enemy. Communications is one of the deciding factors in quickly getting the most men and equipment where they can accomplish the greatest good.

RADIO . . . TELEPHONE . . . TELEGRAPH

All have a vital role in the giant web of communications which is the unseen hand guiding the destiny of our fighting men in every sphere of action. All of this communications equipment depends on ELECTRICAL INSULATING MATERIALS for its successful operation.

CONTINENTAL-DIAMOND is making thousands of insulating parts for Military Communications Equipment. Parts fabricated from C-D insulating materials engineered to remain stable from 70°F. below zero to 160°F. above zero.



A few of the many C-D insulating parts being made for War Equipment from C-D products DILECTO . . . DILECTENE . . . VULCOID . . . DIAMOND FIBRE . . . MICABOND . . . CELORON. Complete technical data is available in bulletin GF. Write for it today on your business letterhead.

DISTRICT OFFICES: New York - Cleveland - Chicago - Spartanburg, S. C.
West Coast Rep., Marwood, Ltd., San Francisco - Sales Offices in principal cities

Q-44

Continental - Diamond FIBRE COMPANY

Established 1895 . . Manufacturers of Laminated Plastics since 1911—NEWARK 15 • DELAWARE

PRECISION CONTROL OF TIME INTERVALS

assured with **Paragon**

PRESET TIMERS

Paragon improved manually preset timers can be preset to perform a great variety of operations . . . to allow a given operation to continue for almost any pre-determined time limit . . . to close or open a circuit at the end of the preset time. Synchronous motor operated. Assures absolute accuracy of the timing cycle. Not affected by vibration or changes in ambient temperature. Supplied as standard with single pole, double throw switches and choice of 10 time ranges and 3 types of mounting . . . 2400 series for flush mounting, 2500 for surface mounting, 2900 for wall mounting.

2509 for surface mounting.

Paragon Chicago
BUILDERS OF ELECTRICAL EQUIPMENT SINCE 1903

PARAGON ELECTRIC CO.
703 OLD COLONY BUILDING
CHICAGO 5, ILLINOIS

Mr. Tops, the Paragon symbol of top quality.

Manufacturers Issue Earnings Reports

Among the electrical manufacturers which have recently issued earnings reports are the following:

Blaw-Knox—Net income for nine months ended September 30 amounted to $1,390,113, or $1.04 a share, compared with a net of $1,153,132, or 86 cents a share in the first nine months last year.

General Cable—Nine months to September 30, net income after $8,050,000 provision for federal taxes on income was $1,700,232, against $1,609,150 after $6,575,000 taxes last year.

Elliott Co.—Net profit for nine months ended September 30, 1944, totaled $483,249 after charges and estimated reserves for federal income taxes and renegotiation, equivalent after provision for preferred stock dividends to $2.01 a share on 189,190 shares of common stock.

Worthington Pump & Machinery—Including domestic subsidiaries, nine months, net profit, $2,129,893, or $5.86 each on 280,082 common shares, against $3,073,457, or $9.38 each on 274,871 shares last year. Company reports 1944 net is after provision in third quarter for 1944 renegotiation and that prior to this provision, net income was slightly in excess of 1943 earnings.

•

Pays $94,034 for Ideas

Production-wise and idea-minded employees in busy war plants of the Westinghouse Electric & Manufacturing Co. saved the war effort $835,100 in labor and material costs of armament production in the first six months of 1944 by suggesting new and better ways of getting things done. "Men and women have handed in 20,545 war production suggestions in that period," Charles R. Riker, coordinator of the Westinghouse suggestion system, stated. For these ideas, he reported, the suggesters were paid a total of $94,034, an increase of $12,629 over awards paid during the previous six months.

•

Opens New York Office

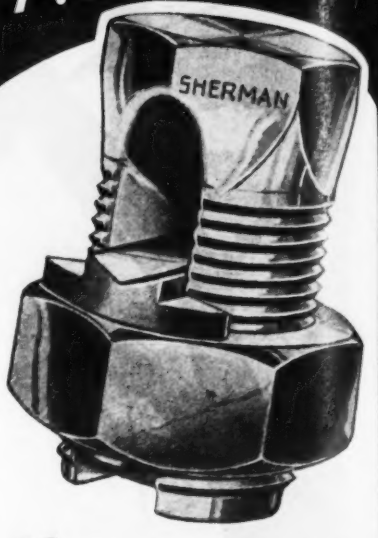
Littelfuse Inc., has announced the opening of an eastern office at 70 Pine Street, New York. Jack D. Hughes has been appointed sales manager of this new eastern division. Mr. Hughes was formerly production manager of the Littelfuse plant in Chicago.

•

Re-Opens Chicago Office

Announcement has been made by The Beryllium Corp. of Pennsylvania of the reopening of its Chicago sales office. Headquarters are in the Engineering Building, 205 West Wacker Drive. Thomas E. Neal has been named district manager.

Again Available!



Sherman High Strength *Bronze* Service Connectors

It's a pleasure to announce that we are again stocking and shipping these fine quality Sherman Split Bolt Connectors that are so universally liked.

Sherman Connectors are made from silicon bronze averaging more than 90,000 lb. tensile strength per square inch. Threads on the body are not pressed or stamped, but are die cut and checked with precision gauges to mate perfectly with the tapped threads in the nut.

All connectors have full hex heads and nuts are extra thick. The solid, reinforced spacers provide maximum bearing surface on the wire and nut. Extra long pilot, for easy assembly.

Extra Length connectors available for three wires.

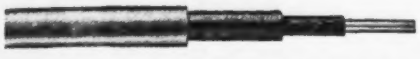
Write today for Trade Bulletin 22 giving full data!

H. B. *Sherman* MFG. CO.
BATTLE CREEK, MICHIGAN

NOTICE

Rockbestos A.V.C. provides PERMANENT RELIEF

from Wire-Failures in "Hot-Spot" Locations



ROCKBESTOS A.V.C. 600 VOLT SWITCHBOARD WIRE
(National Electrical Code, Type AVB)

Sizes No. 18 to No. 4/0 AWG with varnished cambric and impregnated asbestos insulation and gray, black, white or colored flameproof braid.

Combine fire insurance and fine appearance in your switchboards with Rockbestos Switchboard Wire. It is fireproof and will not dry out under heat. Sharp, clean bends can be made without cracking as the asbestos wall acts as a cushion under the braid. Rockbestos A.V.C. Hinge Cable and Switchboard Bus Cable have the same fireproof and heatproof characteristics.

ROCKBESTOS A.V.C. 600 VOLT MOTOR LEAD CABLE
(National Electrical Code, Type AVA)

Size No. 18 AWG to 1,000,000 CM insulated with two walls of impregnated asbestos and a high-dielectric varnished cambric insert, with a heavy asbestos braid overall.

Heatproof, fireproof, greaseproof and oilproof, will not dry out and crack, won't burn or carry flame, and remains permanently flexible. For coil connections, motor and transformer leads where extreme heat and fire hazards are encountered as in steel mills, etc.

THE ROCKBESTOS A.V.C. CONSTRUCTION THAT PROVIDES LONG WIRE LIFE

Rockbestos A.V.C. Power Cable, at left, and similarly insulated Motor Lead Cable (National Electrical Code, Type AVA) has a maximum operating temperature rating of 110° C. (230° F.) and this permanently insulated construction:

1 A tough, rugged asbestos braid, resistant to heat, flame, moisture, oil, grease and corrosive fumes.

2 Outer felted asbestos wall, impregnated with heat, flame and moisture resistant compounds, serves as an effective barrier against high ambient temperatures and flame.

3 Lubricated varnished cambric for high dielectric strength and added moisture resistance, protected from heat, flame and oxidation between two felted asbestos walls.

4 Felted asbestos insulation, also impregnated with heat, flame and moisture resisting compounds, withstands conductor heating overloads and won't dry out, bake brittle or burn.

5 The conductor is perfectly and permanently centered in helically applied insulation.

One of 122 different wires and cables developed for severe operating conditions by Rockbestos.

WON'T bake brittle, bloom, burn or rot.
RESISTS moisture, oil, grease and fumes.

Get *permanent* relief in circuits located in the "hot-spot" installations in your plant . . . around furnaces, forging presses, kilns, steam lines and other hot locations . . . by wiring with Rockbestos A.V.C. . . . the wire that gives continuous service in high operating temperatures.

Why does Rockbestos A.V.C. stand up where other wires fail? Because it has a *permanent asbestos insulation* and braid impregnated with heat-, flame-, and moisture-resistant compounds that withstand conductor heating overloads and high ambients. It won't bake brittle, dry out, crack, flow, rot or de-center and resists oil, grease, alkalies and corrosive fumes.

Put wire performance insurance in your circuits . . . wire with *permanently insulated* Rockbestos A.V.C. One or more of the 122 standard constructions will fit your exact requirements. When ordering or inquiring, please furnish priorities information required under CMP regulations. For complete information and samples, write nearest branch of:

Rockbestos Products Corporation, 970 Nicoll Street
New Haven 4, Connecticut

★ **BUY MORE WAR BONDS**

ROCKBESTOS A.V.C.

The Wire with Permanent Insulation

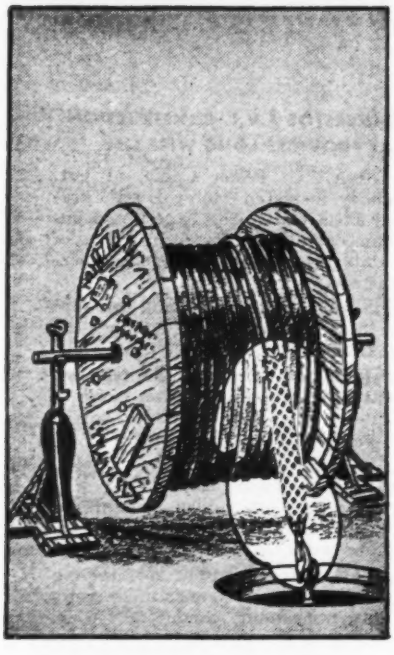
NEW YORK, BUFFALO, CLEVELAND, CHICAGO, SEATTLE, ST. LOUIS, LOS ANGELES, SAN FRANCISCO, PITTSBURGH, PORTLAND, ORE.

SPEED

CONSTRUCTION

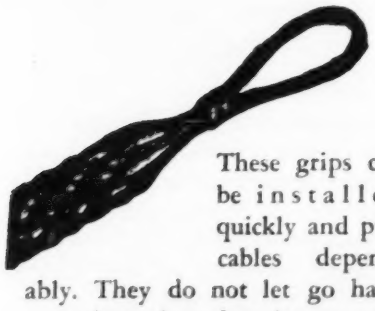
and EXPANSION

of PLANT FACILITIES



RELIABLE CABLE GRIPS

For Pulling in Wires and Cable



These grips can be installed quickly and pull cables dependably. They do not let go halfway through a duct because the wires pull with evenly distributed load. Eight different styles—all supplied in a full range of sizes.

Reliable
ELECTRIC COMPANY
OVER 35 YEARS SERVICE TO THE UTILITIES
3123 CORNELL AVENUE • CHICAGO 13 ILLINOIS

Field Reports on Business

Reports from the field indicate the projection of large scale construction, involving extensive expansion of airfields and facilities, highways and rebuilding of storm devastated areas. The accent in the electrical field in on special lighting supplies. Retail trade sales boom under the holiday impetus.

NEW YORK

With the exception of the Middle West region, little change in the general business picture developed during November compared with the previous month, according to the business survey committee of the National Association of Purchasing Agents. It is pointed out that in the Middle West, war orders are declining in some large industries.

Last week for the second successive week new financing was at a standstill in New York, while efforts continued to put the Sixth War Loan over.

Civil engineering construction volume in continental U. S. totaled $35,953,000 last week. This volume was 31 percent below the total reported to *Engineering News-Record* for the corresponding week in 1943, but it topped the $23,189,000 reported for the holiday-shortened preceding week. The week's construction brought 1944 volume to $1,636,496,000 for the 48 weeks, a decrease of 44 percent from the $2,937,565,000 reported for 1943 period.

Department store sales in the Metropolitan district showed an increase of 11 percent last week in comparison with the similar week of last year.

NEW ENGLAND

Large scale construction projects involving extensive expansion of airfields and facilities, highways, and rebuilding of storm devastated areas are beginning to shape up for spring operations. Recent plans announced of the CAA including expenditures for New England airfields totaling about $30,000,000 (contingent on appropriations from various aviation boards) are of interest to manufacturers of special lighting supplies. So are plans now being prepared by sponsors of a federal bill in which more than $30,000,000 is to be set aside for highway improvements with emphasis on bypasses and traffic routes through congested urban centers. Wickford, R. I., and Haverhill, Mass., are seeking to install additional street lighting. Large schedules for house wiring are being tabulated by architects who are busy on pushing through plans for rebuilding summer residences in the Cape Cod hurricane devastated region.

Application for a high frequency radio transmission station has been filed by the Claremont Eagle Inc., Clarement, N. H. B. F. Sturtevant Co., Hyde Park, Mass., has installed Silentvane fans in a group of New York glass plants. A contract for installing a lighting system at a Maine naval station has been awarded to Kerr Electric Co., Auburn, Maine.

Negotiated contracts received by manufacturers during the past fortnight included $25,744 worth of electrocardigraphs, Cambridge (Mass.) Instrument Co.; radar apparatus and replacement parts; motor and turbine spare parts, and communication apparatus. Awards for ignition harness spare parts and jack switches were received by Connecticut companies. Electrolytic capacitors and voltmeters are moving at a steady pace, and magnet wire, rubber-insulated cable, and friction tape are in demand.

New England manufacturers placed bids on capacitors, resistors, electrically controlled medical apparatus, rubber insulated cord, electric wiring supplies, and metering equipment. Movement of wiring supplies to overcome storm damage to telephone systems in New England resulting in an estimated $1,000,000 loss are under way.

PACIFIC COAST

Present volume of orders is good though the considerable increase in the number of orders and the decrease in average value tells its own story. Competition is exceedingly keen for anything outstanding, such as fittings for a group of destroyers or such an order as the Marine Corps' recent purchase of nearly ten carloads or approximately 750,000 # 9 glass insulators.

Orders include a G.E. award of $29,9[illegible] for transformer cores and coils for San Francisco; a $190,167 award to General Cable, covering approximately 46,000 ft 1,500,000 cm single oil-filled cable, 8,000 gallons oil for same; signal cable, etc. for City of Los Angeles; and awards for pumping plants of $30,672 and $242,845 for Klamath Falls and Oakland, respectively.

Another new group of housing projects includes low bids of $547,374 for 260 temporary family dwellings in San Francisco; $1,099,000 for 44 buildings in San Diego; and $698,888 for 224 family apartments at Pacific Beach near San Diego.

There will apparently be no early hoped-for partial reconversion of the coast lumber industry to civilian production because of forthcoming Signal Corps requisitions for plane lumber and especially for line cross-arms. In fact, production has been hampered by a wet early winter and truck tire shortage.

Other industrial developments include an iron ore crushing plant for Kaiser at Iron Springs, Ore.; a $524,000 installation of wind tunnel and aeronautical laboratory for Consolidated Vultee at San Diego; and approval of Spokane, Portland, and Seattle Railway's system of electric protective signals to cover 35 stations and cost $426,39[illegible]

CHICAGO

WPB recently authorized the manufacture of 3,082 four-burner electric ranges before the end of the year by Norge division of Borg-Warner Corp., Muskegon Heights, and Gibson Refrigerator Co., Greenville, Mich. The number of ranges planned for production this year was raised to 76,607 for the country as a whole.

A Federal Reserve Bank estimate of the post-war industry outlook in Illinois, Indiana, Iowa, Michigan and Wisconsin places production in the first year after defeat of Japan at 25 billion contrasted with 13½ billion in 1939 and 35 billion in 1943.

The electrical machinery group, according to the estimate, may expect demand level to be considerably above production both in the interim period between European and Pacific wars and for at least a full year thereafter. Facility expansion in this group during the war has been eighth among all industry groups compared with seventh ranking in peacetime. Wartime production for the group was estimated to be eighth, although value of output is more than triple the 1939 level.

HERE'S A TRIP
that will do you a Lot of Good

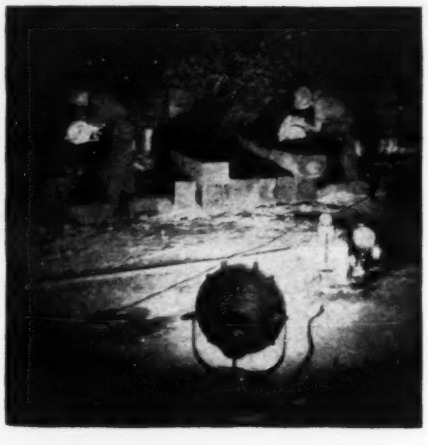
© American Map Co., Inc., New York, No. 10634

From Port Chester, New York, to Chungking, China . . . with plenty of stops in between.

Just one trip of many . . . made by a Homelite service man . . . to get facts . . . to find out how Homelite Portable Generators are performing and standing up under the tough conditions of war.

On trips like these . . . to Alaska, Africa, India and all the theatres of war, Homelite men get the "dope" first hand. And they transmit their information back to our engineering department where new advancements in design and performance are constantly being made to meet the pace.

Yes, trips like these will do you a lot of good. For they have piled up a wealth of priceless experience that will enable us to give you better generators, better pumps and better blowers, than you ever had before.



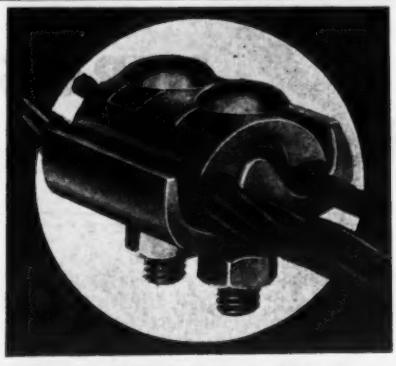
THE BENEFITS FOR YOU

Better cold weather operation . . . better hot weather operation . . . new cooling methods . . . advanced type bearings . . . less trouble and maintenance . . . much longer wear . . . more power . . . more portability . . . these and many other features will be but standard advantages of the New Homelite Gasoline-engine-driven Generators, Pumps and Blowers that you will get and use, after the war is over.

HOMELITE CORPORATION
PORT CHESTER, NEW YORK

PORTABLE PUMPS • GENERATORS • BLOWERS

3 POINT CONTACT *Line Clamps*



ARMY (E) NAVY

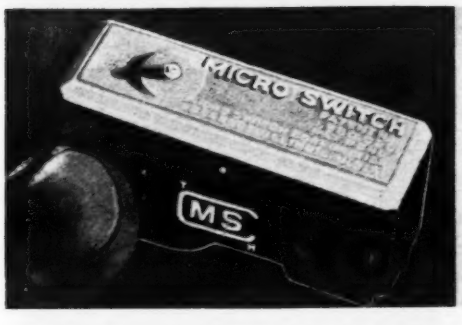
ANDERSON

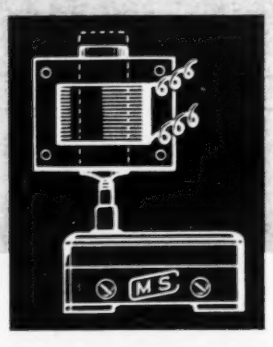
Anderson Line Clamps accommodate a wide range of cable sizes and the belled grooves prevent conductor damage. They have been thoroughly time-tested in the field.

In every conductor combination Anderson design provides three-point contact between conductor and clamp.

New Catalog! **Ready shortly after the first of the year.**

ANDERSON BRASS WORKS INC.
Birmingham, Alabama





UTILITIES FIND MANY SPOTS FOR MICRO SWITCH

. . . Because they lend themselves to Most Exacting Applications

Micro Switches lend themselves to the most exacting utility applications, not only because they are small, but because there is built into that tiny space capacity to switch 1200 volt amperes at line potentials from 125 volts A.C. to 460 volts A.C. . . . a million or more operations with maintained accuracy of response.

Illustrated here is the use of a Micro Switch for Solenoid Control. The solenoid, when pulled in, operates a spring plunger Micro Switch to control other circuits.

Micro Switch is the only precision, snap-action switch which is equipped with a complete line of accessories, actuators and housings . . . with the exclusive feature of replaceability of the switching unit in the field.

The basic Micro Switch is a thumb-size, feather-light, plastic enclosed, precision snap-action switch that operates on force differentials as low as ¼ ounce and movement differentials as low as .0002".

Micro Switch Handbook-Catalog No. 60 contains complete details as to electrical characteristics, construction, applications, dimensions, and other information. We will be glad to mail it to you on request. Write for it today.

INVEST IN VICTORY
. . . BUY EXTRA
WAR BONDS

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MICRO MS SWITCH
TRADE MARK

A DIVISION OF FIRST INDUSTRIAL CORPORATION

FREEPORT, ILL., U.S.A., Sales Offices in New York, Chicago, Cleveland, Los Angeles, Boston, Dallas, Portland, (Ore.)

Sales Opportunities

FLORIDA—Electric Department, Jacksonville, is considering expansion in steam division at generating station, with installation of additional high-pressure boilers and accessories, in accordance with recommendations made by a special committee investigating project. Estimates of cost will be made soon.

NEBRASKA—Farm Crops Processing Corp., Fourth and Jones Sts., Omaha, operating a commercial alcohol plant for production for government, will carry out expansion, including additional buildings with machinery and electrical equipment for heavy output. It is understood that project will include a by-products plant for manufacture of high protein cattle feed from distillery waste. Entire program will cost about $5,750,000 and will be financed by Defense Plant Corporation. Work will begin at early date.

IOWA—Municipal Utilities Department, Indianola, will receive bids until December 20 for extensions and improvements in municipal power plant, including installation of new 1,000 to 1,250 b.hp. oil engine-generator unit and accessory equipment. Cost estimated about $100,000. Buell & Winter Engineering Co., Insurance Exchange Bldg., Sioux City, is consulting engineer.

MASSACHUSETTS — Wyman-Gordon Co., Inc., 105 Madison St., Worcester, manufacturer of steel forgings, plans new plant with main one-story building, 175 by 400 ft., and auxiliary structures; tract of land has been acquired. Cost reported over $1,000,000, with machinery and electrical equipment. Project will have a priority rating. J. R. Worcester & Co., 79 Milk St., Boston, are consulting engineers.

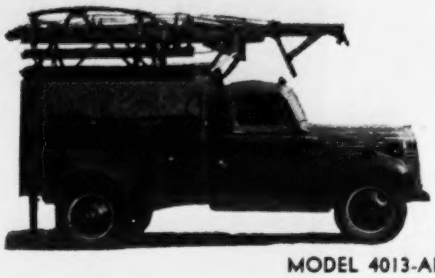
WISCONSIN—Wisconsin Power & Light Co., Madison, plans new transmission line to hydroelectric generating station. Cost estimated about $415,000. Permission has been secured from state commission and work is scheduled to be placed under way at early date.

WASHINGTON — Spokane, Portland & Seattle Railway Co., 1101 N. W. Hoyt St., Portland, Ore., has plans maturing for new electric signal protection system. Cost estimated about $426,000. A priority rating has been secured and work will begin soon.

NEW YORK—St. Regis Paper Co., 230 Park Ave., New York, has approved an expansion and improvement program at sulphite pulp and paper mills, including additional buildings, with machinery and electrical equipment for large advance in present capacity. A new paper-making machine will be installed. Cost reported close to $3,000,000. It is understood that project will have a priority rating, with work to proceed at once.

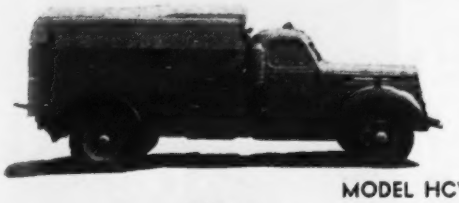
NEBRASKA—Rural Electric Co., Pine Bluffs, Wyo., has made application to Nebraska state commission for permission to construct four new power lines.

CALIFORNIA—Bureau of Yards and Docks, Navy Department, Washington, D. C., has approved immediate construction of new steam-generating station at Naval Air Sta-

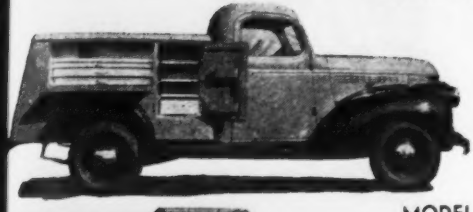


MODEL 4013-AL

MODEL MCW115



MODEL HCW-127



MODEL LIU-78

MODEL 4013-AT

MODEL 4013

IN YOUR X-DAY PLANNING

The Telephone Industry has its X-DAY problem, in varying degrees, in common with most of America's industries.

Good business practice requires as comprehensive a plan as possible—as early as possible.

The replacement of automotive equipment is usually a part of this plan and in this . . .

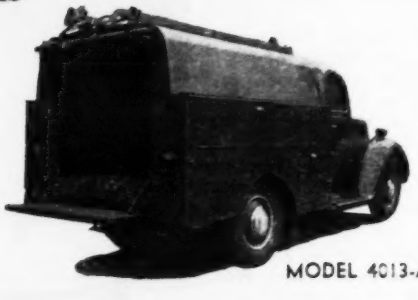
YORK-HOOVER CAN HELP YOU!

With a complete line of light, medium and heavy-duty line bodies, as well as service and installation units, we are in a position to provide the definite information you want.

Many body types are available now; if you have the chassis.

YORK-HOOVER'S long experience, plus exceptionally modern manufacturing facilities can definitely help you with your plans.

We're anxious to be of assistance . . . so, Write us NOW.



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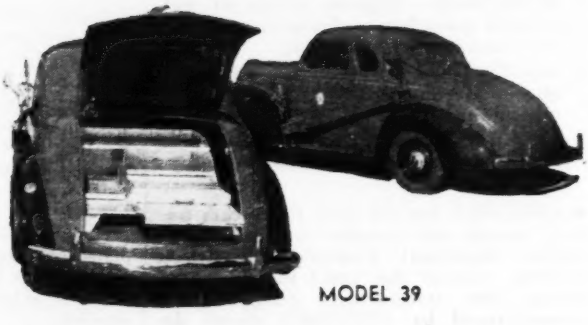
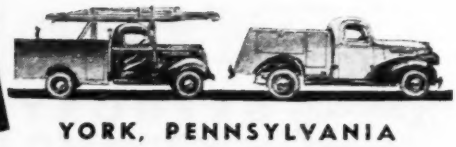


MODEL 39

BODY DIVISION

YORK-HOOVER CORPORATION



YORK, PENNSYLVANIA

GREGORY TRANSFORMERS

Power Distribution and Special Types

The immediate dependable answer to transformer problems . . . .

750 KVA Gregory Oil-Immersed self cooled Distribution Outdoor Transformer

- **UNIQUE DESIGN — afford low copper and core losses — extra factor of safety protects against temporary overloads or power surges.**
- **CONSTRUCTION—tanks constructed of heavy gauge copper bearing steel welded throughout.**
- **OIL — Hi-Grade insulating oil used exclusively.**
- **BUSHINGS — Highest grade of wet process porcelain — featuring solderless connectors exclusively.**
- **ACCESSORIES — Highest Quality obtainable meeting our exacting requirements.**
- **INSULATION — Coordinated with bushings to protect against surges.**

• GREGORY for the past fifty years has been serving our country and our United Allies. Municipal, Federal, and R.E.A. projects all over the world have come to realize that transformers designed and manufactured by GREGORY means dependable, long life service and satisfactory operation. GREGORY Transformers conform to A.I.E.E., E.E.I., and N.E.M.A. standards. All transformers are backed by an iron-clad guarantee.

Our engineering staff and technical experience is at your disposal. Tell us your transformer requirements or problems

GREGORY EST. 1893 Hi-Grade

GREGORY ELECTRIC CO.

2538 So. STATE ST. CHICAGO 16, ILL.

tion. Contract for building and auxiliary facilities has been awarded to Trepte Construction Co., 2001 Kettner St., San Diego, at $357,460. Equipment will be furnished by government and purchased under separate contracts.

TEXAS—Board of City Commissioners, San Antonio, has authorized plans for new fire alarm system in different parts of city, with electric signal stations and other facilities. Cost estimated about $325,000. It is understood that this will be a post-war development.

NEW JERSEY—Johnson & Johnson, 500 George St., New Brunswick, manufacturer of surgical dressing, bandages, etc., has plans under way for initial building of proposed new plant; tract of about 14 acres of land recently was acquired. Cost estimated about $250,000, with mechanical and electrical equipment. Other structures will be erected at later date. Ballinger Co., 105 South 12th Street, Philadelphia, Pa., is architect and engineer.

ALABAMA—Power and Water Department, Sheffield, plans extensions in rural electric system as a post-war project, totaling close to 75 miles of primary and secondary lines, service connections and other facilities.

MARYLAND—Board of Awards, City Hall, Baltimore, plans early call for bids for new pumping station, to eliminate pollution of Patapsco River. Cost estimated about $200,000, with motor-driven pumping machinery, controls and auxiliary equipment.

WEST VIRGINIA—Monongahela West Penn Public Service Co., Fairmont, is reported planning new 132,000-volt transmission line as a post-war project, for power supper for new mill of Goodyear Tire & Rubber Co., Inc., and service for other industries. No estimate of cost announced.

KANSAS—Municipal Electric Department, Pratt, plans expansion in steam-electric generating station, with installation of new turbine-generator unit, boiler and auxiliary equipment to double present capacity. Plans will be prepared at early date. A priority rating has been secured from WPB.

INDIANA—Studebaker Corp., Chippewa St., South Bend, now in production for government, has approved plans for two new one-story additions, 100 by 350 ft., and 100 by 250 ft. Cost estimated close to $500,000, with machinery and electrical equipment. Work will be placed under way at once. Giffels & Vallet, Inc., Marquette Bldg., Detroit, Mich., is architect and engineer.

NEBRASKA—Nebraska Power Co., Omaha, plans extensions in transmission lines. Application has been made for permission and work is scheduled to begin as soon as granted.

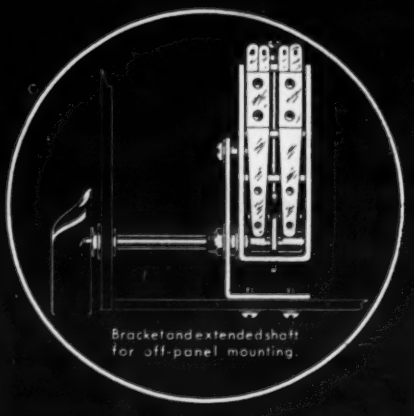
GEORGIA—Jackson Electric Membership Corp., Jefferson, is arranging a post-war expansion program in rural electric system in parts of three counties, totaling about 250 miles of primary and secondary lines, with service connections and other operating facilities. Cost estimated close to $270,000.

OHIO—Light and Power Department, City Hall, Cleveland, is arranging fund of $1,750,000 for post-war expansion and improvements in municipal power plants, with installation of equipment for increased capacity.

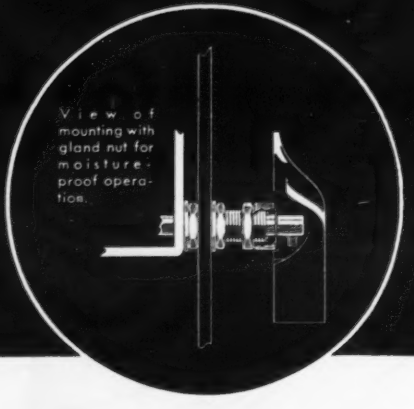
McGRAW ELECTRIC COMPANY
CLARK WATER HEATER DIVISION
5201 West 65th Street, Chicago, Illinois

CLARK *Electric* WATER HEATERS
A TOASTMASTER PRODUCT

Series 6300 Mossman Heavy Duty Turn Switch.

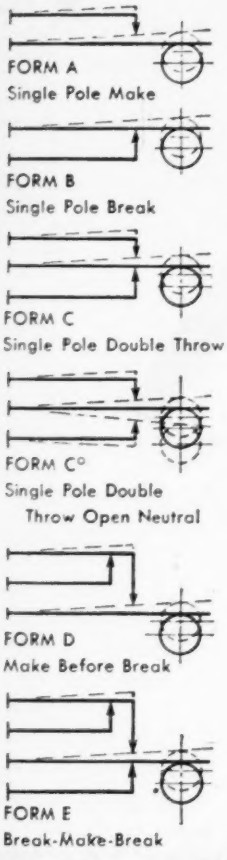


Bracket and extended shaft for off-panel mounting.



View of mounting with gland nut for moisture-proof operation.

BASIC CONTACT FORMS



MOSSMAN SERIES 6300 HEAVY DUTY TURN SWITCH

Permits Almost Unlimited Circuit Arrangements

Latest development in the Mossman line of precision heavy duty multiple circuit turn switches is the Series 6300 . . . a big, husky switch for panel mounting that permits a most versatile control set-up.

Utility engineers will find this switch most useful in such applications as:

1. **Indication in remote control or telemetering circuits.**
2. **Supervisory control circuits in load dispatching.**
3. **Communication control circuits in utility and industrial plants.**
4. **Testing and calibration in meter departments and for tube testing.**

The Series 6300 Mossman Heavy Duty Turn Switches are available as either three position (Series 6303) or two position (Series 6302) switches. An almost unlimited series of combinations of contact assemblies may be built up by use of any combination of the six basic forms shown.

Standard heavy duty contacts are of 3/16" diameter fine silver, rated at 10 amperes, 110 volts A.C., non-inductive. Extra heavy duty contacts are of 5/16" silver alloy rated at 20 amperes, 110 volts A.C., non-inductive. Breakdown rating of springs to ground is 2000 volts, A.C.

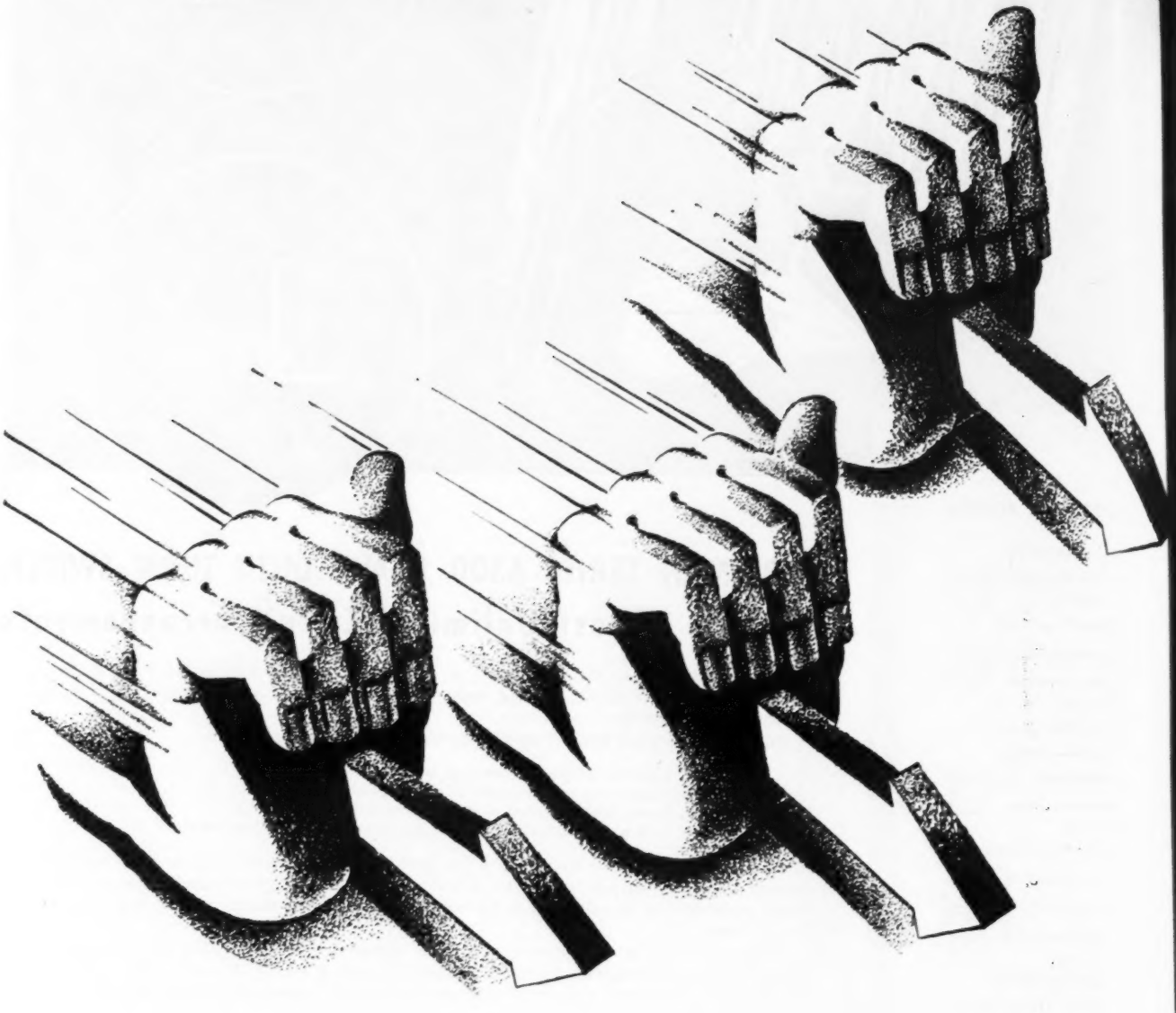
Send for complete information on the new Series 6300 Mossman switches. Also ask for catalog which describes the full line of Mossman precision electrical components, including many types of heavy duty, multiple circuit lever switches, turn switches, push switches, plug jacks and other special switching components.

DONALD P. MOSSMAN, INC., 612 N. Michigan Ave., Chicago 11, Ill.

MOSSMAN

Electrical Components

THREE NEW PARTNERS . . . GOING



TERMINAL TOWER
CLEVELAND, OHIO

AHEAD WITH DRESSER

DRESSER INDUSTRIES now number ten.

Formerly, we were seven companies helping to bring basic services to the user more efficiently.

Our three new partners, each a specialist in its fields, both round out and broaden Dresser's scope of usefulness. This larger Dresser group can now serve industry and consumers with more products and greater experience.

The new Dresser members are bulwarked by an organization that assures their customers continued progress in product improvement, greater wherewithal for pioneering research and steady maintenance of service.

Dresser Industries, Inc., has progressed through the management principle of giving to alert, independent know-how an adequate backing and pooled resources. From these, each member draws teamed strength far greater than it could enjoy alone. The three new members of Dresser Industries, Inc., increase opportunities for mutual aid among the teammates, and at the same time, draw from the group advantages for those they serve.

MEMBER COMPANIES

Dresser Manufacturing Division
Bradford, Pa.

The Bryant Heater Co.
Cleveland, Ohio

Clark Bros. Co., Inc.
Olean, N. Y.

Pacific Pumps, Inc.
Huntington Park, Calif.

Bovaird & Seyfang Mfg. Co.
Bradford, Pa.

Dresser Mfg. Co., Ltd.
Toronto, Ont.

Van der Horst Corp. of America
Olean, N. Y. Cleveland, Ohio

PLUS

*International Derrick & Equipment Co.
Columbus and Marietta, Ohio
Torrance, Calif. Beaumont, Texas

*Roots-Connersville Blower Corp.
Connersville, Ind.

*Stacey Bros. Gas. Construction Co.
Cincinnati, Ohio

DRESSER Pipe couplings and repair devices for pipeline systems. Rings and forgings.

BRYANT Gas-fired boilers, winter air conditioners, furnaces, unit heaters and conversion burners for residential, commercial and industrial heating.

CLARK Engines and compressors for oil production and refining. Marine and stationary Diesel engines.

PACIFIC Hot-oil charging pumps; boiler-feed pumps; general-service pumps for the petroleum and other industries; oilwell plunger pumps; deep-well turbine pumps.

INTERNATIONAL DERRICK Oilwell pumping units, derricks and masts, drawworks, rotary tables and drilling units. Airport, communications and electric-power-line equipment and prefabricated steel buildings.

ROOTS-CONNERSVILLE Positive displacement and centrifugal blowers, exhausters, boosters and compressors. Air and liquid pumps and meters.

STACEY BROS. Storage holders, tanks and pressure vessels for the gas, oil, chemical and food industries.

BOVAIRD & SEYFANG Pumping engines, jacks, "powers", storage tanks and allied supplies and equipment for oilfields.

VAN DER HORST PORUS-KROME—a patented process of applying chromium lining on cylinder walls, piston rings and crankshafts—for longer wear.

DRESSER INDUSTRIES
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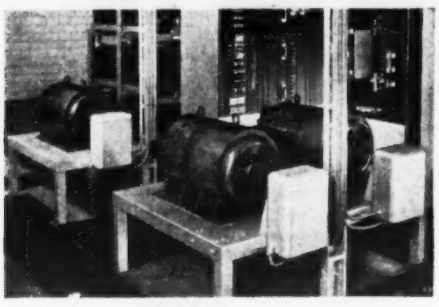
Thru Its Automatically Controlled Safe, Continuous Floating Charge—



THE DIVERTER POLE MOTOR-GENERATOR

Insures BEST Battery Performance At All Times

If a standby or control battery is to give maximum service life combined with high storage efficiency, it must be kept fully and properly charged. This means that the charger floating with the battery must stay actively on duty at all times providing a continuous, safe, controlled floating charge.

The inherent characteristics of the DIVERTER POLE GENERATOR definitely provide the essential requirements to insure this kind of service.

The DIVERTER POLE GENERATOR fully and completely Automatic; eliminates all manual attention of charging and requires only periodic inspection.

Specially designed, carefully constructed and thoroughly tested the DIVERTER POLE GENERATOR insures a constant charging voltage controlled within very close limits under all loads—a continuous floating charge to the battery day and night—protects itself against damage in overloads by shifting all excess load onto the battery—is both mechanically and electrically quiet—and is economical in operation and maintenance.

Over thirty years of service in thousands of installations have proved beyond question the exceptional value of the DIVERTER POLE-GENERATOR for a floating charge with Standby and Control Batteries. It will pay you to investigate.

Write for Bulletin No. 96 TODAY

Diverter Pole Construction

The Electric Products Co.
1731 CLARKSTONE ROAD · CLEVELAND 12, OHIO

New York Cities Allotted $4,525,419 Utility Taxes

Sixty-two New York cities have just received $4,525,419 as their quarterly share of the State's two percent tax on utility services. A previous payment of $4,558,150 brought total payments to $9,083,569, and two other quarterly payments to be made in January and April 1945, are expected to total an equal amount.

Distribution is based on the proportionate population of the cities. New York City's $6,563,015 was the largest for the half year, and Sherrill's $1,922, the smallest.

Formerly, the State retained all of the receipts from the tax. On recommendations of Governor Thomas Dewey, the 1944 Legislature voted the tax refund program effective for a one-year period to provide immediate financial relief for the cities which are required by law to use the money for reduction of local taxes required for payment of debt, interest and principal, outstanding last January 1.

•

Twelfth 82,500-Kw. Unit Put on the Line at Boulder Dam

A twelfth 82,500-kw. unit was put in operation at the world's largest power plant, Boulder Dam, on the Colorado River between Arizona and Nevada, at the end of October, it was reported by Harry W. Bashore, commissioner of the Bureau of Reclamation.

Joining eleven other 82,500-kw. units, one 40,000-kw. unit and two station service units, the installation brings the total capacity of the plant to 1,034,800-kw.

Power generation began at Boulder Dam in September, 1936, and in June, 1937, power was first delivered under contract to the city of Los Angeles, one of the first contractors and principal power user. Installation of four 82,500-kw. generators was completed in March, 1937.

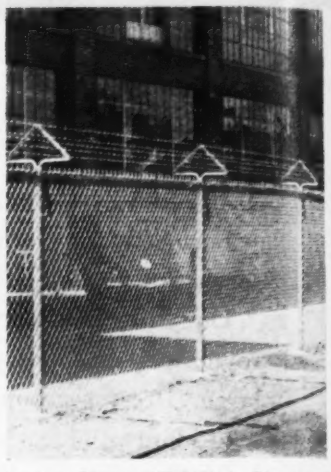
•

6 Kentucky Cities Will Use Standard TVA Rates

Six west Kentucky cities and four cooperatives which have been charging "interim" Tennessee Valley Authority rates since June 10, 1942 will establish standard TVA rates about April 1, 1945. The reduction in rates amounting to $300,000 annually has been delayed until power is available from the Kentucky Dam. The cities are Hopkinsville, Bowling Green, Russellville, Franklin, Murray, and Mayfield.

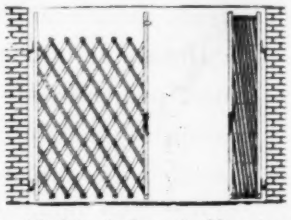
Stewart IRON and WIRE FENCES

Metal restrictions have been modified to permit the manufacture and sale of Chain Link Wire Fence, Folding Gates, Window Guards and Wire Mesh Partitions for certain industrial uses. You may be able to qualify. So tell us what you need and we will advise as to priority procedure.



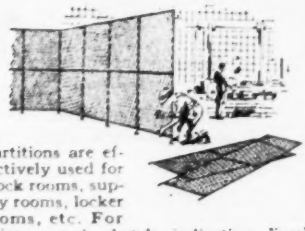
Typical Stewart 5TH Chain Link Wire Fence Installation

STEEL FOLDING GATES



Furnished in single or double gate construction. When requesting prices send sketch indicating width and height of opening.

WIRE MESH PARTITIONS and WIRE WINDOW GUARDS



Partitions are effectively used for stock rooms, supply rooms, locker rooms, etc. For prices, send sketch indicating lineal footage, arrangement of doors, pass-out windows, etc. Window Guards are furnished any size, any shape. Made with ¾" or ½" round frame or ¾" to 1" channel frame. When writing for prices, indicate width and height of openings. Also state anchorage conditions.

THE STEWART IRON WORKS CO., Inc.
1101 Stewart Block
CINCINNATI 1, OHIO

GLASS-TO-METAL SEALS

by the Thousand!

HUMIDITY-PROOF

SHOCK-PROOF

LEAK-PROOF

Another modern electrical development pioneered and perfected by Sprague

Pioneered many months ago by Sprague, glass-to-metal seals for Sprague Capacitors and hermetically-sealed *Koolohm Resistors have progressed far beyond any "laboratory curiosity" stage. Not only are they being produced commercially at better than 10,000 seals per day, but they have proved highly efficient both electrically and mechanically. Seal sizes range from very small up to 3" diameter. They work equally well with practically any metal including steel, brass, and monel metal, and do not require the use of glass bushings and adjacent metal rings with "matched" temperature coefficients of expansion.

There are, of course, plenty of "scientific" reasons why glass-to-metal seals of this type are not feasible. Here again, however, the allegedly impossible has simply provided the incentive for another outstanding Sprague engineering achievement. Actually, the only disadvantage to the seals so far uncovered is the fact that corona voltages are a little lower than we'd like them to be—yet this limitation only becomes a factor at voltages upwards of 25 KV. In all respects, the Sprague glass-to-metal seal answers the old problem of guarding Capacitors and Resistors adequately against leaks and moisture—and without organic bushings or other materials which might be attacked by fungus.

Today, glass-to-metal sealed Sprague Capacitors and *Koolohm Resistors are available in 8,000 electrical characteristic combinations—which is another way of saying that there is a sealed unit for every application that needs one. Details gladly sent on request.

SPRAGUE ELECTRIC COMPANY, NORTH ADAMS, MASS.

(Formerly Sprague Specialties Co.)

ARMY E NAVY

SPRAGUE

*T. M. REG. U. S. PAT. OFFICE

PIONEERS OF ELECTRICAL-ELECTRONIC PROGRESS

PAGE FENCE - Since 1883

• AMERICA'S FIRST WIRE FENCE •

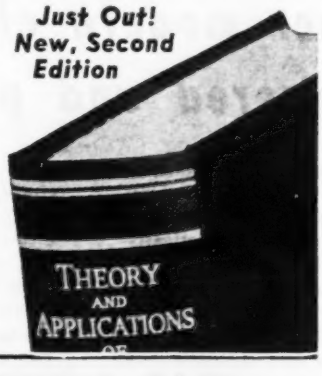
Aluminum Again Available

• PAGE, first to offer chain link fence of aluminum wire, now announces availability of this superior, long-lasting fence of heavy gauge wire to those who are entitled to proper priorities. Complete information, cost estimates on either aluminum or galvanized steel chain link fence, and priority assistance, can be had from the Page Fence Association member nearest you. If you do not know the name and address of this fence engineering and erecting firm, write or wire to the PAGE FENCE ASSOCIATION district office in Atlanta, Bridgeport, Chicago, Denver, Pittsburgh, New York or San Francisco and your inquiry will receive immediate attention. PAGE FENCE ASSOCIATION, Headquarters: Monessen, Pa.

PRODUCT OF PAGE STEEL & WIRE DIVISION—AMERICAN CHAIN & CABLE COMPANY, INC., BRIDGEPORT, CONN.

For sound approach to new problems in electron tube applications—

Just Out! New, Second Edition



This book gives engineers and research workers a thorough, coordinated groundwork in tube and circuit theory, with emphasis on fundamental principles and their use in many applications in industrial electronics, communications, power, and measurements. Meeting the need for a single volume to assemble and coordinate present knowledge of theory and application of electron tubes, the book covers its subject authoritatively and in detail, from the fundamental principles of atomic structure, excitation, ionization, radiation, and emission, to practical material on the design of voltage and power amplifiers, phototube circuits, power-control circuits, power supplies, and measuring instruments.

• In this edition the chapter on Detection and Modulation and that on Oscillation have been brought abreast of developments in the field to improve the book's usefulness to engineers and researchers.

In its 15 chapters you will find such valuable new material as: treatment of cathode-follower amplifiers, discussion of inverse-feedback filters, graphical explanations of modulation, comprehensive treatment of oscillator theory, improved analysis of condenser-input filters for rectifiers, analyses of cathode-ray deflection, and more material on amplifier analysis by square waves.

THEORY AND APPLICATIONS OF ELECTRON TUBES

By HERBERT J. REICH

Professor of Electrical Engineering, University of Illinois

Second edition, 716 pages, 640 illustrations, $5.

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(Books sent on approval in the United States only.)

Recent Rate Changes

NASHVILLE (TENN.) ELECTRIC SERVICE has announced a 15 percent reduction in power rates for commercial and industrial consumers, effective July 1, 1945, "if business and revenue conditions remain favorable." Plant officials said the reduction will be accomplished by removing a 10 percent surcharge, which it is estimated would effect an annual savings of $375,000 to the two classes of consumers.

WISCONSIN GAS & ELECTRIC CO.'s electric bills to residential, commercial and municipal customers in 172 communities will be reduced $79,000 annually under a new schedule approved by the state Public Service Commission. The new rates will save residential users $56,979 yearly, commercial users $14,636 and street lighting bills of municipalities will be cut $7,393 annually. Street lighting costs in cities served by the Wisconsin-Michigan Power Co. will be reduced by $580 a year. Both these companies are subsidiaries of the Wisconsin Electric Power Co. The subsidiary reductions follow recent slashes of $276,690 made by the parent company in regular rates affecting 65 communities in conjunction with a modification of the 10 for one plan.

ARKANSAS POWER & LIGHT CO. has filed with the state Utilities Commission a new proposed electric rate schedule for livestock development in the Arkansas rice growing sections. The proposed schedule will offer cheaper power to rice farmers who agree to use pumping facilities at "off-peak" periods and at night to supply water for live-stock. Only farmers who have electric water pumps for rice farms will be affected. Livestock development in rice areas of the state has been "enormous," officials of the utility company said, and the lower rates will be offered "purely as an inducement for livestock farming."

LOWER ST. LAWRENCE POWER CO.'s new rate schedules have been approved by the Quebec Public Service Board. For domestic service in towns with 500 customers or more, the rates will be $1.25 a month for the first 15 kw.-hr.; six cents per kilowatt-hour for the next 35 kw.-hr.; three cents per kilowatt-hour for the next 150 kw.-hr.; 1.25 cents per kilowatt-hour thereafter. For towns with 100 to 499 customers, the new rates are $1.25 a month for the first 14 kw.-hr.; six cents for the next 36 kw.-hr.; three cents for the next 150 kw.hr.; 1.25 cents thereafter. Where there are less than 100 customers, $1.25 is the rate for the first 13 kw.-hr.; six cents per kilowatt-hour for the next 37 kw.-hr.; three cents for the next 150, 1.25 cents thereafter.

LAPORTE GAS & ELECTRIC CO. and the city of Laporte, Ind., have reached a compromise agreement under the terms of which consumers will save an estimated $72,979 in rate reductions. The agreement is subject to approval by the state Public Service Commission. The reductions will go into effect soon and in return for the reductions the city agrees to drop its litigation to purchase the utility from the Northern Indiana Public Service Co. The company has also agreed to cut street lighting costs.

WISCONSIN PUBLIC SERVICE COMMISSION has announced that public utilities in the state made rate reductions of more than $610,000 a year during the first nine months of 1944. Total reductions of $622,143 were partially offset by increases of $10,779

Advertisement

SYLVANIA NEWS
CENTRAL STATION EDITION

DECEMBER — *Published in the Interests of Better Sight and Sound* — 1944

Plastic Finish for Reflectors Proves Its Superiority

Sylvania reflectors coated with plastic finish emerging from a part of the curing process.

After extensive study of reflector coatings, Sylvania has standardized on a plastic finish of exceptional hardness, flexibility, and light-reflecting efficiency. This finish —*not* an ordinary paint—is produced by the polymerization under a unique heat treatment, of different molecules to form a new chemical compound.

This plastic finish has proved far superior to paint in its resistance to moisture and corrosive vapors. It is more flexible than vitreous enamels, and withstands distortion and bending more successfully.

Judging of Fixture Designs Under Way

All entries are now in for the Sylvania Fluorescent Fixture Design Competition, and the four judges—Howard M. Sharp, Allan E. Parker, C. A. Carpenter and Lurelle Guild—are engaged in selecting the 14 winners.

The judges' decision will be announced in New York on January 19, and will be reported in the February issue of SYLVANIA NEWS. The awards—one prize each of $500, $300, $200, and $100, and 10 prizes of $50 —will be made by Walter Poor, President of Sylvania Electric Products Inc.

Sylvania Lamp Life Ratings Newly Defined for Longer Time-on Cycles

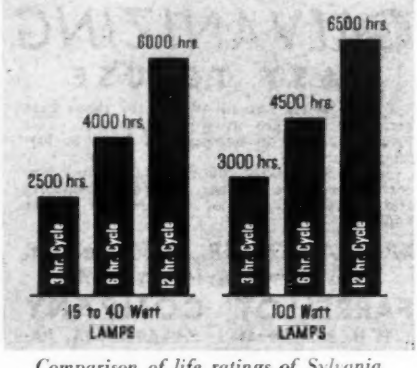
Permit More Favorable Cost Comparison In Recommending Fluorescent Lighting

A more exact definition of the life ratings of Sylvania Fluorescent Lamps, based on a planned cycle of operation, indicates that public utility representatives, in discussing fluorescent lighting, can now point to the probability of considerably longer lamp life than would have been expected under previously published ratings. Hence preliminary estimates of over-all operating costs can be substantially reduced in many instances, thus placing Sylvania Fluorescent in a more favorable cost position.

BASIS OF RATINGS

Previous life ratings of Sylvania Fluorescent Lamps have been based on a 3-hour burning cycle. In most commercial and industrial applications, the time-on cycle is considerably longer than 3 hours. Since the frequency of starting is of course an important factor, longer time-on cycles will naturally be reflected in longer lamp life.

For this reason, Sylvania has extended its life data to include 6-hour and 12-hour cycles, ratings for which are shown in the accompanying graph. Lighting experts of utility companies will be interested in noting these new ratings, which can be applied in estimating probable lamp replacement costs for new installations.



Comparison of life ratings of Sylvania Fluorescent Lamps for 3-, 6- and 12-hour burning cycles, when burned under specified test conditions.

LIGHTING SHOW TO BE HELD IN APRIL

An event of outstanding interest to utility lighting men—the NEMA International Lighting Exposition—is scheduled to take place in the spring at the Palmer House in Chicago. Dates set for the Exposition are April 19 through 23, 1945.

Sylvania is already completing plans for its participation in this event. According to present plans, Sylvania will be one of the largest exhibitors at the Exposition, with a comprehensive display of lighting products.

Those attending the Exposition are cordially invited to plan to visit the Sylvania booth.

Goodwillie Selected To Aid Utilities in Fluorescent Sales

Sylvania Electric Products Inc. announces the appointment of Mr. Stuart Goodwillie to cooperate with utility lighting departments in promoting sales through better lighting. Mr. Goodwillie, formerly with E. I. Du Pont de Nemours and Trundle Engineering Corporation, will be available for consultation on all lighting sales problems.

SYLVANIA ELECTRIC PRODUCTS INC.
Salem, Massachusetts

MAKERS OF FLUORESCENT LAMPS, FIXTURES, ACCESSORIES, INCANDESCENT LAMPS, RADIO TUBES, CATHODE RAY TUBES, ELECTRONIC DEVICES

Save money by using Blackburn "Gripits" instead of split bolt connectors, at the house service entrance, or for connecting any two wires together, end to end, as illustrated. Made of DURONZE, a high-strength silicon bronze that's actually stronger than steel. Circular construction gives extra strength along the line of pull of the screw. "Gripits" will not stretch or distort when tightened—will not come loose.

Over 100 Conveniently-located Jobbers' Stocks

JASPER BLACKBURN PRODUCTS CORP.
Main and Clinton Sts., St. Louis (6), Mo.
Builders of Quality Connectors for Over 10 Years

GALVANIZING REPAIR SOLDER

EASY TO USE

F. G. Solder has an affinity for those base materials that are usually galvanized. This property results in homogenous bond at low temperature.

F. G. Solder has the appearance and corrosive resistance of hot dipped galvanizing and leaves no line of demarcation where applied.

SPECIAL OFFER $1.50 per lb.
F.O.B. Phila., Pa. 14 bars per lb.

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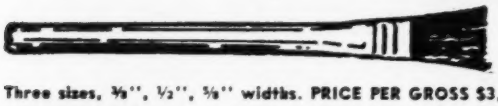

A hardy tool for any plant using soldering as part of production. The acid and dope brush illustrated is made to meet rigid requirements. First quality tinned handles resist acid action.

Three sizes, ⅜", ½", ⅝" widths. PRICE PER GROSS $3, $4 and $5 respectively, F.O.B. Phila., Pa.

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Flexibal

THE *Modern* GUARD THAT DOES THE JOB BETTER AT LOWER COST

5-6-7-8 ft lengths available for IMMEDIATE SHIPMENT

Write for details and prices

S. E. OVERTON COMPANY
SOUTH HAVEN, MICHIGAN

Electric utilities made total cuts of $54[illegible] 931.

KITTITAS COUNTY (WASH.) PUBLIC UTILITY DISTRICT has announced a reduction in electric rates, lowering the charge on the first block of 50 kw.-hr. from 8 to 7 cents. The board said the reduction would cut the district revenues 9 percent.

NORTHERN ILLINOIS UTILITIES CO.'s five-year contract with the city of Belvidere, effecting a substantial reduction in rates, has been approved by city council. The contract calls for $9,192 for service, which now costs the city $12,167.

NEW BRUNSWICK PUBLIC UTILITIES BOARD, St. John, N. B., has approved a reduction in rates for light and power by the Eastern Electric & Development Co., Sackville, N. B., and the Moncton Electricity & Gas Co., Moncton, N. B.

•

Odd Shaped Commutators Now Metaplated on Plastic

Intricately designed commutators can now be easily manufactured by a method employing metal plating on plastics, Metaplast Co., New York, has announced.

Under the new system, any commutating contour may be secured by molding a plastic base or core in which grooves or depressions can be molded or ground wherever a contact surface is desired. These surfaces are then made flush with the non-conductive plastic surface by Metaplating silver or any other metal. The commutating surface is then ground smooth to provide a one-piece conductor and non-conductor unit.

Previously, such commutators were made by locking alternate sheets of bakelite and silver on a threaded brass shaft, which was insulated by a bakelite bushing. The pressure of the lock nuts would cold flow the plastic separators above the commutating surface. Other difficulties eliminated by the new method are the soldering of segments together and the need for a special calibration chart for each instrument using the commutator. The charts previously had been required because of the variances in the thickness of each silver and bakelite segment used.

•

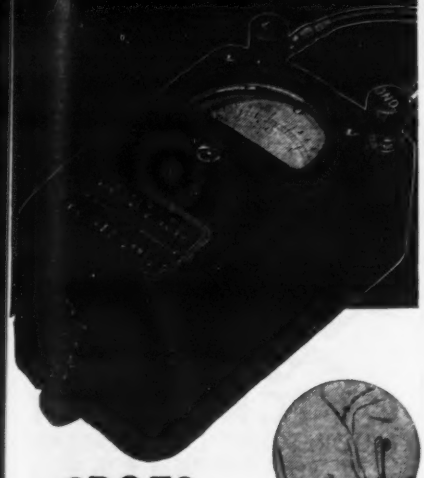
Norge to Expand Output

Norge Division of Borg-Warner Corp. has anounced that it had exercised an option to purchase the Effingham, Ill., plant of the Vulcan Corp. If final agreement to buy is reached, production of ranges will be concentrated at the Effingham plant, Howard E. Blood, Norge president, stated. He added that he thought it "quite probable" that Norge would have to expand the plant in order to meet expected high demand in the post-war period.

HOLTZER-CABOT

ELECTRONIC

INSULATION RESISTANCE TESTER



SPOTS FAULTY INSULATION

Generates full voltage regardless of cranking direction.

Visual indication of correct testing voltage.

Easy to read scale.

Light Weight.

Portable.

You can guard against possible insulation failures in electrical circuits and equipment by testing with the Holtzer-Cabot Insulation Resistance Tester. This portable self-contained unit spots faulty insulation before it can become dangerous. Here's how it works — connect terminal marked "L" to the electrical circuit and terminal "GRD" to a ground . . . rotate the handcrank of the generator at speed which lights up indicating buttons . . . reading on the scale indicates if insulation is faulty or not.

The Holtzer-Cabot Insulation Resistance Tester requires no batteries or external power supply. It is always ready to use in the plant, laboratory or field. The generator delivers 500 volts testing voltage regardless of cranking direction. Range is from 0 to 100 megohms. Protect your equipment from insulation failures by making periodic insulation tests with the Holtzer-Cabot Insulation Resistance Tester. Write for bulletin today.

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Division of First Industrial Corporation

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Ingenious New Technical Methods

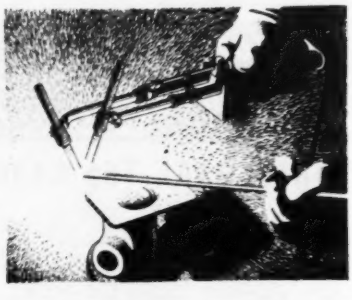
Presented in the hope that they will prove interesting and useful to you.

New 9000° Arc Torch can be used for Welding and Brazing all ferrous and non-ferrous metals and alloys

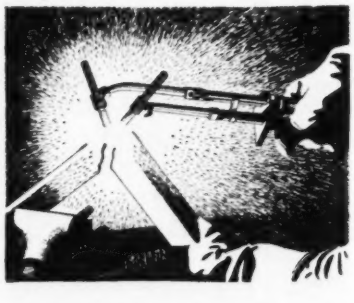
Now an arc torch that makes it possible to do most jobs *electrically* that previously were thought possible only with gas. This attachment for arc welders provides an independent source of heat by means of two carbons. It is capable of producing intense heat, approximately 9000° F., over 2000° hotter than an oxy-acetylene flame. Pure heat, no oxygen or gas to contaminate the weld. No pressure to force the molten metal away or blow holes in light sections.

Developed to capitalize to the fullest on the time-saving advantages of electric welding, the new Mid-States 9000° arc torch can be used with any AC or DC electric welder. It opens up new horizons of service in this field, never before possible with an electrically operated instrument.

New uses are being found every day for products that have been familiar to us for years. Wrigley's Spearmint Gum, always enjoyed for its chewing satisfaction, is now proving with the fighting men overseas many benefits which will be useful to you in peacetime. One of the big factors in mass production is the alertness and efficiency of the man on the job. The chewing of Wrigley's Spearmint will help keep you alert and wide-awake during those work periods that, while seemingly dull and monotonous, call for watchfulness in order to get perfection in the final assembly.



For BRAZING Steel, Cast Iron, Malleable Iron, Copper, Brass, Bronze, and other ferrous and non-ferrous metals.



For HEATING to Straighten or Bend, etc.

You can get complete information from Mid-States Equipment Co., 2429 S. Michigan Ave., Chicago 16, Illinois

Y-167

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Reduce accidents and service interruptions

COHARDITE insulation molded on H. K. Porter bolt cutters protects the Linemen and equipment with a tested 20,000 volts dielectric. Available in #0, #1, and #2 sizes with either rigid or swivel head.

Every tool tested to its full rated dielectric strength for one minute R.M.S. before it leaves our plant.

A full range of COHARDITE insulated small tools carried in stock for meter and distributor departments.

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A Live Wire is no better than its Connections

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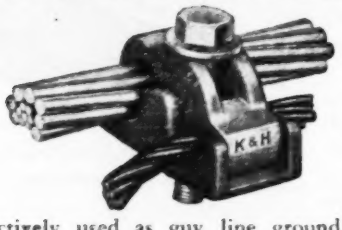

Effectively used as guy line ground, or transformer and lightning arrester connection to A. C. S. R. or copperweld conductors where the diameters may be from 8-A copperweld to .595" A. C. S. R. armour rods. Wire sizes .595" to 5/32".

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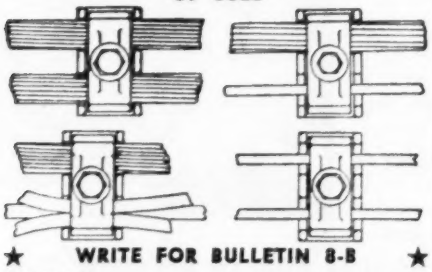

★ WRITE FOR BULLETIN 8-B ★

K H KRUEGER & HUDEPOHL
Solderless Terminal Lugs and Connectors
SE VINE AT THIRD • CINCINNATI 2, OHIO

REA Allots Funds for New Projects

Funds totaling $1,777,500 have recently been allotted by the Rural Electrification Administration to 26 cooperatives in 16 states. This brings total REA allotments to $514,351,801, of which $15,472,000 represents operations during the current fiscal year.

The funds, details of which are listed below, will be used mainly for the extension of electrical service to farms located near existing lines. No construction will be undertaken which does not meet with the approval of the War Production Board.

ARKANSAS—Riceland Electric Cooperative, Inc., Stuttgart, $185,000.

INDIANA—Hendricks County Rural Electric Membership Corp., Danville, $40,000; Morgan County Rural Electric Membership Corp., Martinsville, $30,000.

KENTUCKY—Farmers Rural Electric Cooperative Corp., Glasgow, $100,000; Shelby Rural Electric Cooperative Corp., Shelbyville, $60,000.

MAINE—Denny's River Electric Cooperative, Inc., Meddybemps, $99,000.

MICHIGAN—Presque Isle County Electric Cooperative Assn., Onaway, $75,000.

MISSISSIPPI—Yazoo Valley Electric Power Assn., Yazoo City, $25,000.

MISSOURI—Ozark Electric Cooperative, Mt. Vernon, $75,000; Farmers' Electric Cooperative, Chillicothe, $75,000; Grundy Electric Cooperative, Inc., Trenton, $25,000; Howell-Oregon Electric Cooperative, Inc., West Plains, $20,000; North Central Missouri Electric Cooperative, Inc., Milan, $20,000.

MONTANA—Valley County Electric Cooperative, Inc., Hinsdale, $195,000.

NEBRASKA—Eastern Nebraska Public Power District, Syracuse, $100,000.

OHIO—Firelands Electric Cooperative, Inc., New London, $50,000; Buckeye Rural Electric Cooperative, Inc., Gallipolis, $26,000.

OREGON—Blachly Lane County Cooperative Electric Assn., Blachly, $25,000.

PENNSYLVANIA—Southwest Central Rural Electric Cooperative Corp., Indiana, $50,000; Somerset Rural Electric Cooperative, Inc., Somerset, $30,000.

SOUTH CAROLINA—Tri-County Electric Cooperative, Inc., St. Matthews, $40,000; Laurens Electric Refrigeration Cooperative, Inc., Laurens, $32,500.

VIRGINIA—Powell Valley Electric Cooperative, Jonesville, $50,000.

WASHINGTON—Public Utility District No. 1 of Douglas County, Waterville, $250,000; Chelan County Electric Cooperative, Inc., Leavenworth, $40,000.

WISCONSIN—Jump River Electric Cooperative, Inc., Ladysmith, $60,000.

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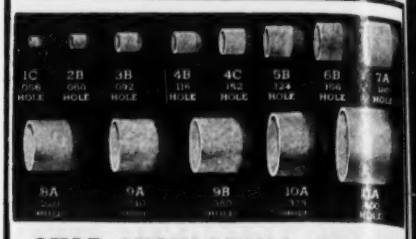
Will Extend Oregon Lines

Pacific Power & Light Co. has been granted permission by the War Department to extend its lines into the big Madras, Oregon, area to help increase agricultural products in that section.



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Use LAVOLAIN ball and socket beads for insulating bare wire. Heat resistant. High di-electric and mechanical strength. Made in U.S.A. Quality beads at low cost. Quickly applied. Flexible. Beads shown above are approximately half actual size. Ask for price list and samples.
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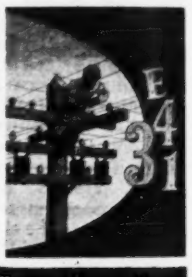
Restrictions have been eased. You can get Premax Metal Markers now. Cost less than stenciling . . . last indefinitely.



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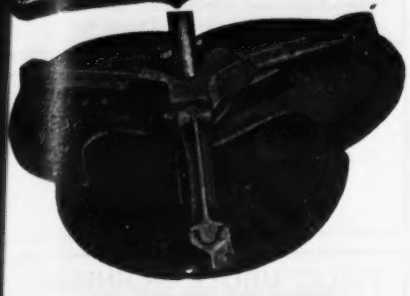

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Now Available— Simplex Pole Pulling Jacks!

Modified priority regulations make this universally used Pole Pulling and Straightening Jack again available for prompt shipment. One or two men can pull or straighten any pole, regardless of size or depth; pull butts or move loaded poles. For a generation, the No. 329 has been cutting costs and reducing "out of service" hours.

No. 329, capacity 15-tons, height 37¾", lift 22".

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LEVER SCREW HYDRAULIC
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Templeton, Kenly & Co.
Chicago (44), Illinois
Better, Safer Jacks Since 1899

BOOK REVIEWS

Ultra-High-Frequency Radio Engineering. W. L. Emery, The Macmillan Co., N. Y. 295 pages, illustrated. $3.25.

Focus here is on the principles with unusual effort made to interpret the field of practice in applying UHF. The book records the Iowa State course and presupposes a familiarity with elementary electronics and communication. Of interest to the power engineer desiring to extend his knowledge into current developments in electronics are the clear-cut discussions of voltage regulators, switching and synchronizing, cathode tube sweep circuits, filters, transient response, impedance transformers, magnetron and klystron, voltage doublers. Other themes deal with wave-guides, coaxials, antenna arrays and propagation. Mathematics throughout is made a servant of clarity in exposition, not as a cloak for erudition and obscurity.

Fields and Waves in Modern Radio. By Simon Ramo and John R. Whinnery, John Wiley & Sons, Inc., New York, N. Y. 502 pages, illustrated. Price $5.

Contrived for student employees of General Electric, the treatment carries physical interpretation hand-in-hand with mathematical exposition so that power and communication engineers can grasp the field-wave concepts. Calculus is essential but not conversance with differential equations. Wave propagation and reflection is launched after half the chapters have laid the foundations. There follows wave-guiding, coaxial paths, shielding, resonant cavities, radiation and Poynting's theorem on electromagnetic power flow from radiators.

How to Pass Radio License Examinations—2nd Edition. By Charles E. Drew. John Wiley & Sons, Inc., New York, N. Y. 320 pages, illustrated. Price $3.

Besides affording compact but adequate answers to some 1,300 questions posed on FCC examinations for the higher grade licenses the book offers the operator for mobile systems a lucid insight into the broader aspects. The many circuit diagrams and discussions of radio principles approach in value the practicality of the less advanced texts. Appendices give laws and regulations, communications abbreviations and a detailing of automatic alarm circuits. The arrangement largely averts the necessity of an index.

English-Spanish Comprehensive Technical Dictionary. Lewis L. Sell. Published by McGraw-Hill Book Company, New York. 1478 pages. Price $30.00.

For the technical American who wishes to put his literary ideas or business proposals into idiomatic phraseology that Spaniards can understand here is a compilation of several hundred thousand simple and compound terms with their Spanish counterparts. An appropriate proportion are terms that only an electrical man would use and thousands more are cognate phrases more or less common to all technology. You can, for example, find the equivalents of third-brush generator, voltage-divider and across-the-line squirrel-cage motor. All in all the treatment is geared to avert ludicrous and lumbering translations that do more damage than good. The book is dictionary size; it does not give the reverse Spanish-into-English nor does it purport to be a lay dictionary—it is strictly technical.

INSULATED BRUSH

For cleaning around electrical apparatus in Power Plants and Sub-Stations.

Handle of selected straight grain wood with high quality, specially designed 11" brush. Eight inch non-conducting fibre surface beyond the hand guard protects against slipping and possible contact with current or apparatus.

The best of materials are used and the workmanship is thorough. Length 36".

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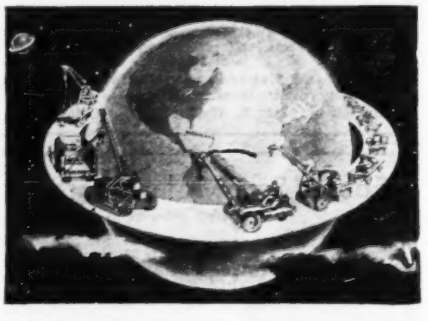

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Power Plants — Industrial Plants
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UNDISPLAYED RATE:
(Not available for equipment advertising)
15 cents a word, minimum charge $3.00. (See ¶ on Box Numbers.)
POSITIONS WANTED (full or part-time individual salaried employment only), ½ above rates.
PROPOSALS, 75 cents a line an insertion.

INFORMATION:
BOX NUMBERS care publication New York, Chicago or San Francisco offices count as 10 words additional in undisplayed ads.
DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED RATE:
The advertising rate is $7.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. E. W.

NEW ADVERTISEMENTS received by 10 A. M., December 18th will appear in the December 23rd issue subject to limitations of space available

WANTED

DESIGNER

A Central New England manufacturer employing over 1000 people needs Draftsman-Designer on telephone and signaling (mechanical) apparatus.

Knowledge of die-casting and plastic applications desirable.

WMC Regulations Prevail

P-773, Electrical World
330 W. 42nd St., New York 18, N. Y.

To Employers Who Advertise for Men:

The letters you receive in answer to your advertisements are submitted by each of the applicants with the hope of securing the position offered.

When there are many applicants it frequently happens that the only letters acknowledged are those of promising candidates. Others do not receive the slightest indication that their letters have even been received, much less given any consideration. These men often become discouraged, will not respond to future advertisements and sometimes even question if they are bona fide.

We can guarantee that *Every Advertisement Printed in the Searchlight Section Is Duly Authorized.* Now won't you help keep our readers interested in this advertising by acknowledging every application received, even if you only return the letters of unsuccessful applicants to them marked, say, "Position filled, thank you." If you don't care to reveal your identity, mail them in plain envelopes.

We suggest this in a spirit of helpful co-operation between employers and the men replying to Positions Vacant advertisements.

Departmental Staff

McGRAW-HILL PUBLISHING COMPANY, INC.

"Put Yourself in the Place of the Other Fellow"

Additional Employment Advertising on page 208

POSITIONS VACANT

PRODUCTION ENGINEER — fractional h.p. electric motors. Should have specialty background in single phase motors, having devoted major effort to efficient mass production. Line will have limited size range. Engineering design experience desirable for development of motors for tooling and production. Permanent connection with outstanding Southern California manufacturer entering household appliance field. Send detail of experience and personal qualifications to A.W.A., Box 68, Station K, Los Angeles, California.

RELAY TESTER—With utility company in the east. Applicant must have practical field test experience and be qualified to test, calibrate, and install all types of relays. Submit details of experience, education, and availability. P-776, Electrical World, 330 W. 42nd St., New York 18, N. Y.

POWER STATION operator experienced in maintenance heavy hydraulic equipment, especially reaction turbines, required by Public Utility in Brazil. Should be capable taking charge of operation large modern hydro electric plant. Location healthy. Give complete resume experience, references, marital status and salary expected. P-763, Electrical World, 330 W. 42nd St., New York 18, N. Y.

ELECTRICAL DRAFTSMAN, experienced in overhead distribution and substation design; also one meter and relay technician, thoroughly competent to repair all types of protective relays, watthour and demand meters and laboratory equipment. Location, Northern Alabama. In reply state experience, age, references, salary desired and when available. P-789, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

(Continued on page 208)

CHIEF ELECTRONIC ENGINEER

Company with seven years background in the field of designing and building automatic photo-electric equipment has Postwar plans that include a great opportunity for an individual who will be expected to handle developmental activity of electronic department. He will supervise electronic department personnel, coordinate activity of plant and field engineers, assume responsibility of entire department as executive head. Applicant should be thoroughly trained in practical as well as theoretical electronics, capable of supervising optical and electronic experimental activity. Should be capable of visualizing electronic coordination with mechanical equipment, able to assist design engineering in development of new units and supervise assembly, wiring, and eventual incorporation of units in completed machines; supervise installation of our machines in customers' plants.

P-785, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

WANTED

Construction Superintendent

Qualified Engineer required by a large Public Utility Company in Canada, who will take full supervisory responsibility for construction of electric Substations of large capacity, and who will also act as Liaison between the Company's engineering staff and the Contractor. Applicants must have thorough experience in similar work. Applications in first instance should contain full personal and professional history, and should be addressed to

P-787, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

Do not apply unless your services are available under Canadian Regulation P.C.246, Part 3, January 19, 1943, administered by the Wartime Bureau of Technical Personnel.

KEY MEN NEEDED

Men for key positions are needed to continue our expansion for present war contracts and contracts for post war motors. We specialize on all types fractional horsepower electric motors and need men for key positions in—

Series Motor Engineer
Induction Motor Engineer
Tool Design Engineer
Manufacturing Supt., also
Tool Draftsman
Design Draftsman

If you are experienced in any of these lines, you can share a very interesting and prosperous future with us.

UNIVERSAL ELECTRIC CO.
300 E. Main St. Owosso, Michigan
Our employees have the Army-Navy "E" Award.

WANTED

HYDRAULIC ENGINEER

Qualified Engineer to act in capacity as Liaison Engineer between Owner and Consultant on the design and construction of a high-head hydro-electric development in Canada. Applicant must have thorough background or experience and responsibility in similar developments. Applications in first instance should contain full personal and professional history, and should be addressed to

P-786, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

Do not apply unless your services are available under Canadian Regulation P.S.246, Part 3, January 19, 1943, administered by the Wartime Bureau of Technical Personnel.

WANTED

DEVELOPMENT ENGINEERS

Mechanical and electrical. Graduate or equivalent training. Required for development work in the following branches:

1. Electro-mechanical devices, communication systems. Must be interested in development and familiar with magnetic circuits.
2. Measuring and control instruments. Background should be in electrical engineering, including electronics.

Statement of Availability Required.

P-774, Electrical World
330 West 42nd St., New York 18, N. Y.

WANTED

ENGINEERS

Two graduate Electrical Engineers are required by a large Public Utility Company in Canada, as follows:—

(a) One who is thoroughly experienced in the design of electric substations of large capacity, making system studies, preparing cost estimates and writing specifications.
(b) One as Protection Engineer, and who has thorough knowledge of modern relay equipment and its application, along with allied subjects.

Applications in first instance should contain full personal and professional history, and should be addressed to

P-788, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

Do not apply unless your services are available under Canadian Regulation P.C.246, Part 3, January 19, 1943, administered by the Wartime Bureau of Technical Personnel.

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IMPROVED INDUSTRIAL PROPERTY

U. S. Nitrate Plant No. 1,
at Sheffield, Alabama, in the

MUSCLE SHOALS AREA

of the

TENNESSEE VALLEY REGION

A total of 149 acres of improved land with power, water, and sewerage facilities installed—adjacent to paved streets and highways. 14 structural steel, brick and sheet metal buildings, with a total floor space of 194,666 square feet, in excellent state of repair. These structures provide adequate space and accommodations for factories, foundries, machine shops, garage, storage and offices.

IDEAL FOR INDUSTRIAL DEVELOPMENT

LOW COST ELECTRIC POWER

Served by main line Southern Railway System. Water transportation available. Excellent schools, churches, and recreational facilities.

Also COMPLETE POWER PLANT to be sold as an operating unit in place, or for dismantling and removal.

For detailed information or an appointment to inspect the property, write

TENNESSEE VALLEY AUTHORITY
Land Division, 108 Vine St.
Decatur, Alabama

—TRANSFORMERS—

BOUGHT and SOLD

We have several thousand transformers in stock for prompt shipment, and invite your inquiries.

PIONEER TRANSFORMER REBUILDERS

We rewind, repair and redesign all makes and sizes.

One Year Guarantee

THE ELECTRIC SERVICE CO., INC.
"AMERICA'S USED TRANSFORMER CLEARING HOUSE"
STATION M **Since 1912** **CINCINNATI 27, OHIO**

WANTED

D.C. METERS—Type C6
A.C. METERS—60 Cycle

Send us a list of the D.C. and A.C. meters you wish to dispose of. We purchase large and small quantities.

The Electric Meter Corporation
Incorporated 1915
1776 Broadway, New York 19, N. Y.

DIESEL ENGINE
WINTON-GENERAL MOTORS

Model 1580 Four Cylinder 14 x 16 330 H.P. Continuous Duty 360 R.P.M. Winton Mechanical Injection Diesel Oil Engine Direct Connected to 225 KW—220 Volt 3 Phase 60 Cycle Generator with Direct Connected Exciter. Complete with Accessories and Control Panel. This unit new in 1936, now in daily service. Manufactory Expansion calling for great power increase therefore this unit for sale.

THE AMERICAN ENVELOPE CO.
134 W. Second St., Dayton, Ohio
Adams 7288

New "SEARCHLIGHT" Advertisements

must be received by 10 a.m. Monday to appear in Saturday's issue

Address copy to the Departmental Advertising Staff

ELECTRICAL WORLD
330 West 42nd St., New York City

POSITIONS VACANT
(Continued from page 207)

WANTED: ELECTRICAL engineer, with some Construction and Plant maintenance or Public Utility experience, for permanent position as an Assistant Plant Engineer in War Production Plant with excellent post-war prospects. Write for interview advising availability, education and background. P-790, Electrical World, 330 W. 42nd St., New York 18, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS — This advertising service of 34 years recognized standing negotiates for high salaried supervisory technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission's. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details. R. W. Bixby, Inc., 262 Delward Bldg., Buffalo 2, N. Y.

POSITIONS WANTED

ELECTRICAL ENGINEER. Graduate, age 42. American, good health, speak Spanish and unencumbered. Majority of past 21 years in supervisory capacity of design and/or construction distribution and transmission systems and industrial installations. Prefer foreign service. Available now. PW-778, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

ELECTRICAL ENGINEER, graduate with 20 years experience in electrical utility engineering desires permanent connection offering opportunity for advancement. PW-791, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

SALESMAN AVAILABLE

ELEC. ENGINEER would like to contact used elec. machinery dealer regarding sales position. 25 years experience. SA-781, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

WANTED

ANYTHING within reason that is wanted in the field served by Electrical World can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

SALES

ENGINEERS WANTED

Experienced electrical men, familiar with low voltage distribution systems to act as sales specialists in important District Offices on following: Panelboards, safety switches, enclosed circuit breakers, bus duct and load centers. Men accepted to receive full training at factory at company's expense before assignment. Write to Supervisor, Technical Employment, 306 Fourth Avenue, Pittsburgh, Pennsylvania, for application form.

WESTINGHOUSE
Electric & Manufacturing Co.

EXPORT SALES ENGINEER

Excellent opportunity for experienced sales engineer who has travelled foreign countries, with thorough knowledge all types prime movers—steam, internal combustion, electric—offered by large western manufacturer with broad postwar field. Mechanical and electrical training essential, knowl-knowledge foreign languages, acquaintance foreign purchasing groups in Washington, D. C., or other large centers desirable.

SW-775, Electrical World
68 Post St., San Francisco 4, Calif.

SALES MANAGER

for plant manufacturing large and small transformers. Must be an experienced salesman with some experience in the control of salesmen and agents and capable of handling correspondence with sales staff. Traveling required.

SW-784, Electrical World
330 West 42nd St., New York 18, N. Y.

POWER FOR PRODUCTION

MOTORS GENERATOR SETS

1—750 KW, 250 volts, Allis-Chalmers, sync.
1—75 KW, 125 volt, General Electric, squirrel cage.
1—15 KW, 250 volt, General Electric, squirrel cage.
1—6½ KW, 125 volt, General Electric, squirrel cage.

MOTORS—3 PHASE 60 CYCLE

1—350 HP, 300 RPM, 440 volt, G.E. slip ring.
1—300 HP, 720 RPM, 2200 volt, G.E. Sl. Rg.
3—300 HP, 450 RPM, 440 volts, General Electric slip ring.
1—250 HP, 600 RPM, 4000 volt, G.E. sync.
1—250 HP, 600 RPM, 2200 volts, G.E. slip ring.
1—150 HP, 1800 RPM, 440 volt, General Electric, squirrel cage.
2—150 HP, 1200 RPM, 2200 volt, Westinghouse, squirrel cage.
1—150 HP, 600 RPM, 440 volt, General Electric, squirrel cage.
1—500 HP, 900 RPM, 440 volt, Lincoln, sl. rg.
1—150 HP, 400 RPM, 440 volt, G.E., sq. cg.
1—145 HP, 600 RPM, 220 volt, General Electric, synchronous.
1—125 KVA, 900 RPM, Westinghouse, synchronous.
1—100 HP, 900 RPM, 440 volt, G.E., slip ring.
3—100 HP, 720 RPM, 440 volt, G.E., slip ring.
1—100 HP, 72 RPM, 440 volt, G.E., sq. cg.
1—100 HP, 720 RPM, 440 volts, General Electric slip ring.
1—100 HP, 600 RPM, 440 volt, G.E., slip ring.
1—100 HP, 600 RPM, 440 volt, G.E., sq. cg.
1—100 HP, 514 RPM, 440 volt, G.E., sq. cg.
2—100 HP, 450 RPM, 440 volt, G.E., sq. cg.
1— 90 HP, 400 RPM, 550 volt, Cr. Whlr, sq. cg.
1— 75 HP, 900 RPM, 4000 volt, Elec. Mach. syn.
1— 75 HP, 900 RPM, 220 volt, Fairbanks Morse, slip ring.
1—75 HP, 900 RPM, 440 volt, G.E., sq. cg.
1—75 HP, 720 RPM, 440 volt, Westghse, slip ring.
1— 75 HP, 720 RPM, 440 volt, G.E., sq. cg.
1— 50 HP, 900 RPM, 440 volt, G.E., slip ring.
1— 50 HP, 900 RPM, 440 volt, G.E., sq. cg.
1—200 HP, 440 volt, 600 RPM, Crocker-Wheeler, slip ring.

MOTORS—D.C. 230 VOLTS

2—450 HP, 400 RPM, G.E.
1—250 HP, 760 RPM, Electro Dynamic.
1—150 HP, 750 RPM, Electro Dynamic.
1—150 H.P. 500 RPM, General Electric, MPC.
1—125 HP, 600 RPM, Westinghouse, SK.
1—100 HP, G.E., 575 RPM.
1— 50 HP, 750 RPM, Westinghouse, type SK.
1— 50 HP, 700 RPM, Crocker Wheeler.
1— 40 HP, 775 RPM, Westinghouse.

TRANSFORMERS

2— 400 KVA, G.E., 4156-240/480 v., Scott taps.
3— 300 KVA, Pittsburgh, 7800/440 volts.
3— 300 KVA Allis Chalmers 2200—220/110.
3— 150 KVA, G.E., 23,000 2300/4000 Y.
3— 150 KVA, General Electric, 2400/240/480 volts.
3— 100 KVA, Westinghouse, 11,430/250 volts.
1— 100 KVA, Pittsburgh, 1375/2750-110/220 volts.
3— 100 KVA, Westinghouse, 13200 250 volts.
3— 100 KVA, General Electric, 2200-220/110 volts.
3— 75 KVA, G.E., 13,500-7500/440 volts.
3— 75 KVA, G.E., 2200/220/110 volts.
1— 75 KVA, G.E., 2400/4800/120/240 volts.
1— 75 KVA, G.E., 3 phase, 4156Y-120/208Y.
3— 50 KVA, General Electric, 2200/220/110.
2— 50 KVA, Phgh., 7500/15,000 volts-110/220 volts.
3—37½ KVA, General Electric, 2200/220/440.
2— 30 KVA, Allis Chalmers, 3 phase, 4156Y/120/208Y.
1— 25 KVA, G.E., 220/110-20/110 volts.
2— 15 KVA, G.E., 2300-115/230 volts.

MOTORS—VARIABLE SPEED 230 VOLTS

1— 90 HP, 470/940 RPM, General Electric.
1— 75 HP, 525/1575 RPM, Electro Dynamic.
1— 35 HP, 500/1500 RPM, Westinghouse.
1— 30 HP, 225/900 RPM, Crocker Wheeler.
1— 30 HP, 400/1200 RPM, General Electric.
2— 25 HP, 300/990 RPM, Electro Dynamic.
1— 20 HP, 750/1500 RPM, General Electric.
1— 15 HP, 300/1200 RPM, G.E.
1—13/18 HP, 350/1200 RPM, Electro Dynamic.
2—11½ HP, 500/1500 RPM, Westinghouse, type SK.
1—6 HP, 600/1200 RPM, General Electric.
1—5 HP, 450/1800 RPM, Crocker Wheeler.
1—5 HP, 400/1600 RPM, Diehl.
1—5 HP, 225/900 RPM, Electro Dynamic.

INSTRUMENTS

25—Westinghouse type U recording ammeters with split core CT.
25—Westinghouse type U recording voltmeters.

TURBO GENERATORS

600 KW, Terry dual bleeder condensing Turbine only.
1—500 KW, G.E., 3 ph., 60 cy., 430 volt, bleeder.
1—375 KVA, Westinghouse, non-condensing.
1—300 KW, G.E., 3 ph., 60 cy., 220 volt, cond.
1—300 KW, G.E., 3 ph., 60 cy., 220 volt, cond.

J. L. HEMPHILL & CO., INC., *Power Equipment*

New York Phone: LOngacre 5-3227 — 1602 53rd ST., NORTH BERGEN, N. J. — *New Jersey Phone: UNion 3-2600*

Power Equipment

Released by Utilities & Industrials

Turbines, Generators, Steam and Oil Engines, Boilers, Motor Generators, Rotaries Transformers, Motors, Compressors, Induction Voltage Regulators, Oil Circuit Breakers, etc.

Service backed by 40 years' experience

BREW, WOLTMAN & CO.
52 Church St. New York, 7, N. Y.

Rotary Converters—3 Ph. 60 Cy.

K.W.	Make	R.P.M.	D.C. Volts	A.C. Volts
1—1500	Whse.	720	650	11500
1—1250	G.E.	720	250	2300
1—1000	Whse.	600	250	2200
1—1000	Whse.	900	600	2300
2— 750	Whse.	1200	600	2300/4000

Rotary Converters—3 Ph. 25 Cy.

2—1500	G.E.	500	225/275	6600
1— 500	G.E.	750	225/275	6600

M. G. Sets—3 Ph. 60 Cy.

1—1500	Whse.	514	250	2300/4600
1—1000	G.E.	720	250	2300/4150
1— 500	G.E.	900	250	440/2300
1— 500	G.E.	720	600	13200
1— 400	G.E.	720	250	2300

BELYEA COMPANY, INC.
51 Howell Street, Jersey City, N. J.

FOR SALE

LOCOMOTIVES

30-Ton Diesel-Electric
5-Ton Plymouth gasoline 36" gauge
15-Ton Porter saddle tank 36" gauge
20-Ton Whitcomb Diesel 36" gauge
21-Ton Porter saddle tank 36" gauge
30-Ton Vulcan saddle tank 56½" gauge
67-Ton American six-wheel switcher
85-Ton Baldwin saddle tank 2-8-2. Oil fuel.

CARS

2—Western Air dump cars, 30 yards capacity
6—All-steel 50-Ton Gondolas. Rebuilt.
19—Flat cars, 50 tons capacity. Rebuilt.
40—Hoppers cars, 50 tons capacity
7—Class III tank cars, 10,000 gallon capacity
40—Class III tank cars, 8,000 gallons capacity
8—Class II tank cars, 8,000 gallon capacity

LOCOMOTIVE CRANES

35-Ton McMyler-Interstate. Steam.
22½-Ton McMyler-Interstate. Steam.
25-Ton Browning. Steam.
15-Ton Industrial-Brownhoist. Gasoline. 50 ft. boom.

GASOLINE CRAWLER CRANES

1—Universal, 24 ft. boom, Caterpillar
1—P & H 600, 60 ft. boom, shovel front and dragline
1—Byers Bearcat 30 ft. boom, ¾ swing.

GASOLINE TRACTORS

2—Allis-Chalmers Model K, (one with blade; one without)
1—International T-35, with angle dozer
1—Caterpillar Model D-35, with blade
1—Cletrac 40-30, with blade

THE HARVEY LEFEVRE CO.
500 Fifth Ave. — New York 18, N. Y.
TELEPHONE PENNSYLVANIA 6-3175

FREQUENCY CHANGER

1000 KW, 460 volts, 3 phase, 25 cycle,
300 RPM, 1570 amperes, serial 4,900,000,
1250 KVA 0.8 p.f. 50-deg. rise General Electric, type ATI-10-1250M-300, with amortisseur winding, with 33 KW disconnected exciter, with
1400 HP 460 volts, 3 phase, 60 cycle,
300 RPM General Electric, 1570 ampere,
1250 KVA p.f. 0.9, 50-deg. type ATI-24-1250M-300 form C, with amortisseur winding.

CHICAGO ELECTRIC CO.
1314 W. Cermak Rd. — Chicago, Ill.

NEW and USED EQUIPMENT AVAILABLE

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Send for new list . . . to

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Port Washington, Long Island, N.Y.
Phone Roslyn 1220

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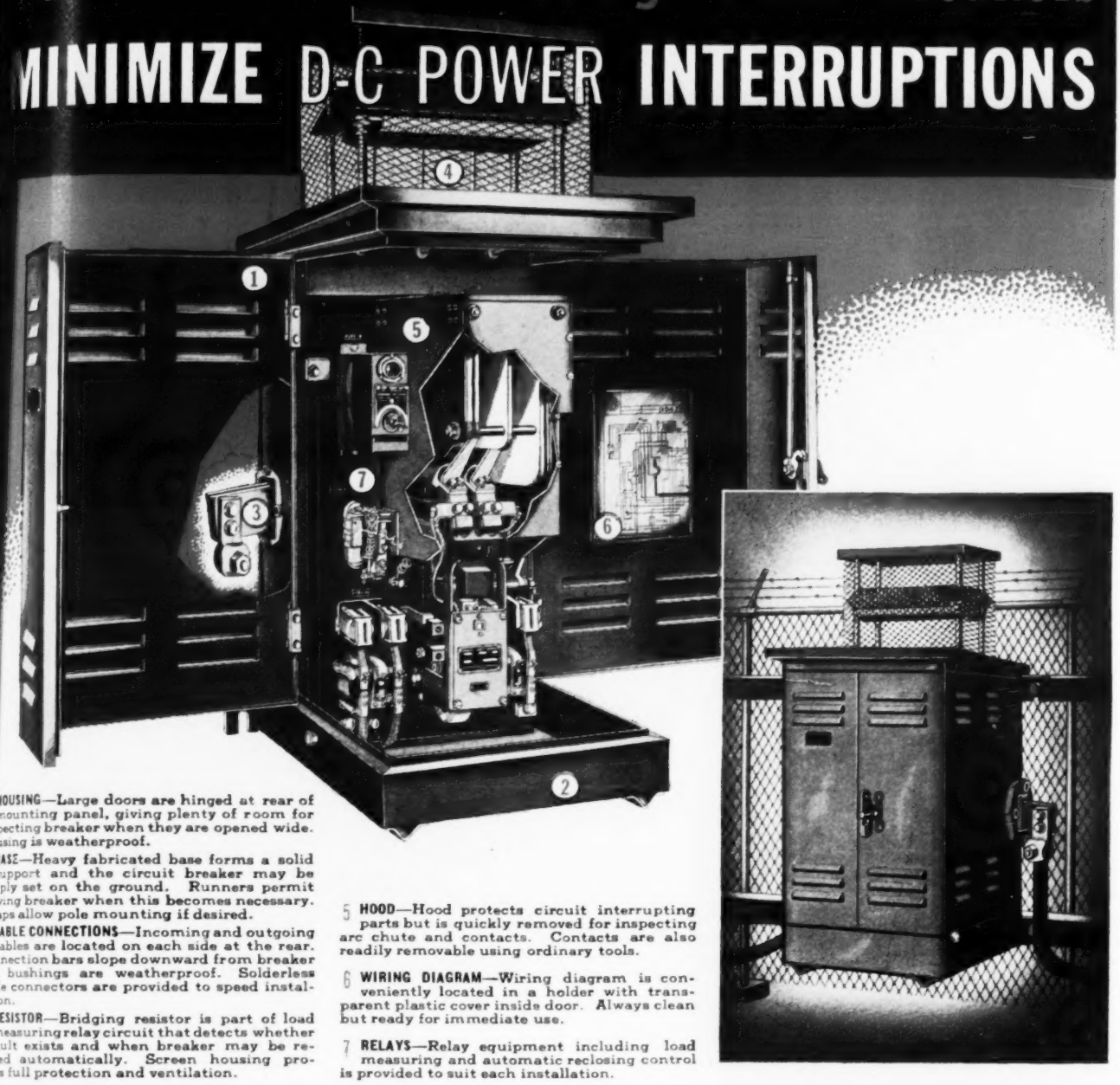
★ **These companies have supplied additional buying information on their products in the 1944 edition of the Electrical Buyers' Reference**

I-T-E Automatic Reclosing Circuit Breakers

MINIMIZE D-C POWER INTERRUPTIONS



HOUSING—Large doors are hinged at rear of mounting panel, giving plenty of room for inspecting breaker when they are opened wide. Housing is weatherproof.

BASE—Heavy fabricated base forms a solid support and the circuit breaker may be simply set on the ground. Runners permit moving breaker when this becomes necessary. Straps allow pole mounting if desired.

CABLE CONNECTIONS—Incoming and outgoing cables are located on each side at the rear. Connection bars slope downward from breaker and bushings are weatherproof. Solderless cable connectors are provided to speed installation.

RESISTOR—Bridging resistor is part of load measuring relay circuit that detects whether a fault exists and when breaker may be reclosed automatically. Screen housing provides full protection and ventilation.

5 **HOOD**—Hood protects circuit interrupting parts but is quickly removed for inspecting arc chute and contacts. Contacts are also readily removable using ordinary tools.

6 **WIRING DIAGRAM**—Wiring diagram is conveniently located in a holder with transparent plastic cover inside door. Always clean but ready for immediate use.

7 **RELAYS**—Relay equipment including load measuring and automatic reclosing control is provided to suit each installation.

These breakers are used to prevent unnecessary or needlessly prolonged interruptions to vital operations in mines, street railways, steel mills or wherever continuous d-c power service is important.

When applied to sectionalized tie-lines as an independent, stub end feeder, tie-feeder or multiple fed circuit breaker, only the section in which trouble occurs is out of service; others continue to operate. Furthermore, a load-measuring relay "feels" the circuit continuously after the breaker has opened and, when the overload or short circuit conditions have been corrected, the breaker recloses automatically. Power is restored without needless delay.

Ask your nearest I-T-E representative or write to I-T-E Circuit Breaker Company, 19th & Hamilton Streets, Philadelphia 30, Pa., for illustrated Bulletin 4404 which describes in detail the I-T-E Automatic Reclosing Circuit Breaker and its applications.

I-T-E REPRESENTATIVES IN ALL PRINCIPAL CITIES

AIR SWITCHGEAR

The importance of continuous low acidity in turbine oil

The chart below illustrates why the "guaranteed" low acidity of Nonpareil Turbine Oil is practically a guarantee of low turbine oil maintenance costs. A Standard Oil Lubrication Engineer will be glad to explain how Nonpareil's resistance to asphaltic deposit formation and corrosion furthur reduces turbine oil maintenance. Write Standard Oil Company (Indiana) office, 910 South Michigan Avenue, Chicago 80, Illinois, for the Engineer nearest you.

The danger area for acidity in a conventional turbine oil varies with the kind of oil used and operating conditions. Even moderately high acidity, however, is always a potential trouble-maker. It reduces the demulsibility of the oil. It attacks certain metals to form metallic soaps, resulting in deposits.

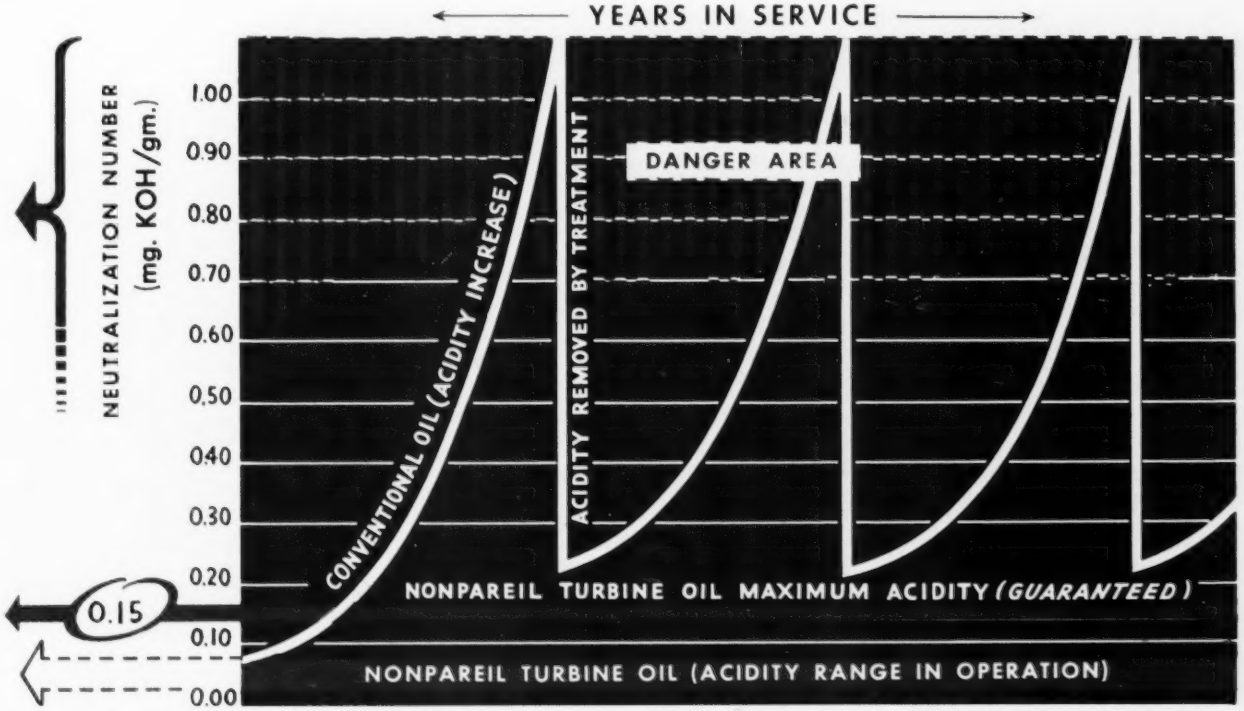
Any oil with a tendency to acidity formation requires continuous watching. It must be "sweetened" periodically, or removed from the turbine oil system for treating. This requires extra oil, or spare batches of oil for replacement while the oil is resting. In many instances, a thorough cleaning of the turbine oil system is necessary because of deposit formation. This may not come at a convenient time—when the turbine is down for inspection—and adds to costs at any time.

All of these problems are eliminated with Nonpareil Turbine Oil because:

Nonpareil is guaranteed (in writing) against any increase in acidity above 0.15 mg. KOH/gm. as long as it is in your turbine. It does not require special treating, resting, or sweetening to control acidity.

Operating records show that the neutralization number of Nonpareil Turbine Oil seldom reaches 0.10 mg. KOH/gm. and will average nearer 0.05, year after year.

Gasoline Powers the Attack . . . Don't Waste a Drop!



The black curve shows a typical record of acidity in conventional turbine oils—how acidity increases and how it is removed periodically by treating to keep out of the "danger area" where emulsions and deposits are apt to form. Note how the neutralization number of Nonpareil Turbine Oil, in service, stays well below the "guaranteed" low maximum limit.

STANDARD SERVICE

STANDARD OIL COMPANY (INDIANA)